Contents—Jan. 1941

Volume XXII No. 1

ARCHIVES OF PHYSICAL THERAPY

DISRAELI KOBAK, M.D., Editor

Suite 712 — 30 North Michigan Avenue, Chicago, Illinois

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Subscriptions — In the United States, its possessions, and Mexico, $5.00 yearly; Canada, $5.50; elsewhere, $6.50 the year.

Advertising rates on application. All advertising copy subject to acceptance by publication committee.

Published monthly at Chicago, Illinois, by American Congress of Physical Therapy.

Entered as Second Class Matter January 29, 1938, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879.

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APPLICATION OF THE NEW FOOD, DRUG, AND COSMETIC ACT TO THERAPEUTIC DEVICES *

THEODORE G. KLUMPP, M.D.

Chief, Drug Division, United States Food and Drug Administration,
Federal Security Agency

WASHINGTON, D. C.

In a broad sense, our Federal Government has made three important provisions for the protection of the citizens of the United States against the exploitation of therapeutic devices. These are (1) the statutes that prevent the use of the mails to defraud; (2) the Federal Trade Commission Act which deals with unfair competition and deceptive practices; (3) the new Food, Drug, and Cosmetic Act. In emphasizing the Federal statutory safeguards, I should also mention that our States and municipalities have an important collateral responsibility in this work. This is particularly true with respect to the practice of the various healing arts, the regulation of which is not a Federal function.

For many years the Post Office Department has been proceeding against articles in this field. Under the statute which prohibits the use of the mails to defraud, the Post Office Department has stood as a strong bulwark holding mail order fakers in check. The law is a drastic one. It operates ordinarily to prevent the fraudulent individual or concern from receiving mail. This is more severe than we might suspect, but several factors prevent it from giving complete protection against frauds. I base these reasons purely upon my own personal opinion. (1) It acts only against frauds which are committed through the use of the mails. (2) Because of the drastic provisions of the law and the fact that it is fundamentally based on fraud, it can only be employed as a weapon against the most overtly fraudulent practices. (3) The promoters of articles against which the Post Office Department has proceeded often sidestep the Government action by changing their names and addresses and perhaps using express and other means of transportation. (4) It is my understanding that representations made to physicians and other practitioners of the healing arts or representations made in the course of the practice of this art are not administratively subjected to this fraud statute.

The Federal Trade Commission, since its creation by the Federal Trade Commission Act of September 26, 1914, has always had jurisdiction over unfair trade practices and, in this category, particularly advertising. Two years and five months ago the Federal Trade Commission Act was amended to relieve the Commission of the burden of proving unfair competition. The Federal Trade Commission has a big and exceedingly difficult job to perform.

On June 25, 1938, the new Food, Drug, and Cosmetic Act was approved by the President. Since passage of this law, an amendment was passed postponing the effective date of many of its provisions. The law did not become fully effective until July 1, 1940. Since I am particularly concerned with the administration of this law, I want to discuss in a little more detail its provisions as they relate to therapeutic devices.

The Act contains two major prohibitions: It provides, among other things, that a device is adulterated if its strength differs from, or its purity or quality falls below that which it purports or is represented to possess. At first glance this language appears a little strange when applied to machines or contrivances, but under it we feel administratively that we may proceed against an ultraviolet lamp that gives off only inconsequential amounts of ultraviolet radiation; clinical

* Read at the Nineteenth Annual Session of the American Congress of Physical Therapy, Cleveland, Ohio, September 2, 1940.

thermometers that fail to give an accurate temperature reading; ozone generators that fail to generate ozone, and others.

The second major prohibition contained in the Act is against misbranding and under this is a broad subsection which declares a device to be misbranded if its labeling is false or misleading in any particular. This was intended to embrace therapeutic representations as well as other labeling material that might be false or misleading. In addition to other general provisions under this section, the law declares a device to be misbranded unless its labeling bears adequate directions for use and adequate warnings. It is also misbranded if it is dangerous to health when used in the dosage or with the frequency or duration prescribed, recommended, or suggested in the labeling thereof. One of the most important general provisions of this Act, which has been called by some an Act in itself, is section 201 (n), which reads as follows:

"[SEC. 201. For the purposes of this Act —]

(n) If an article is alleged to be misbranded because the labeling is misleading, then in determining whether the labeling is misleading there shall be taken into account (among other things) not only representations made or suggested by statement, word, design, device, or any combination thereof, but also the extent to which the labeling fails to reveal facts material in the light of such representations or material with respect to consequences which may result from the use of the article to which the labeling relates under the conditions of use prescribed in the labeling thereof or under such conditions of use as are customary or usual."

The regulation under this section is significant. It reads as follows:

"Regulation. The existence of a difference of opinion, among experts qualified by scientific training and experience, as to the truth of a representation made or suggested in the labeling is a fact (among other facts) the failure to reveal which may render the labeling misleading, if there is a material weight of opinion contrary to such representation."

It might be helpful to attempt to summarize the provisions of the law as they apply to therapeutic devices. Such a summary necessarily runs the danger of over-simplification and reservations for special circumstances and possible exceptions, and certain omissions that do not commonly apply to devices, should be kept in mind.

1. A device must conform with the strength, purity or quality which it purports or is represented to possess.

2. The labeling of the device must be free from anything that is false or misleading. This includes therapeutic representations.

3. The label of the device must contain the name and place of business of the manufacturer or distributor.

4. The quantity of contents must be stated on the label unless the numerical count is less than 6 units and the units can be counted without opening the package.

5. The labeling must bear adequate directions for use.

6. The labeling must bear adequate warnings against use of the device in those pathological conditions or by children where its use may be dangerous to health or against unsafe dosage or methods or duration of administration or application, in such manner and form, as are necessary for the protection of users.

7. The device must not be dangerous to health when used in the dosage, or with the frequency or duration prescribed, recommended, or suggested in the labeling thereof.

8. If it is found by the Administrator to be a device liable to deterioration, it must be packaged in such form and manner and its label bear a statement of any necessary precautions as shall be found to be necessary for the protection of the public health.

What, you may ask, has your Government been doing with devices since the law went into effect? Keep in mind that the section on dangerous devices has been in effect for 26 months and the other provisions relating to devices for only a few months. Up to August 1st of this year, we have taken legal action against approximately 242 shipments of devices. Of these, action was taken in 64 instances because the devices were considered dangerous, 36 cases were based on false and misleading claims, and 142 shipments consisted of mechanical prophylactics which were charged to be defective in that they contained holes.

These devices included health ray lamps, vibrators, inhalers, vaporizers, chemical heat packs, devices for introducing vapors into the nasal chambers under pressure and mechanical prophylactics. More recently steps have been taken against rectal dilators and devices for applying heat and vibration to the prostate, and clinical thermometers. In addition to the above legal actions, we have brought about voluntary compliance with the Act through citations, correspondence and conferences in an untold number of instances. While such changes are all to the good and are an expression of the accomplishment of the purposes of the Act, they nevertheless do not appear in our official figures. We have also investigated a number of diathermy machines which are being sold to the lay user and in our judgment are dangerous. We have found no interstate commerce or practically none in several of these and have, therefore, been unable to start action against their distribution. Insofar as there is no interstate commerce in these, it is, then, a problem for our States and municipalities. However, we shall continue to watch the channels of interstate commerce for such machines.

The attention which we have given to rubber prophylactics has brought out a number of startling revelations. In July 1938 a court decision in another case established a precedent for classifying such articles as drugs. The Food and Drug Administration undertook a survey of articles in this class and found the market literally flooded with articles that were full of holes or made of improperly cured rubber. We found that in certain lots as high as 93% of the samples examined were defective and, therefore, worthless. An average of approximately 75% of those on the market were defective to some degree. Under the old Food and Drugs Act we had no authority to consider the birth control phases of the question, but we were concerned with the use of mechanical prophylactics for venereal disease prevention since we know that the public places its chief reliance in these articles for protection against venereal disease. I have often wondered why rubber prophylactics were rated so low as reliable contraceptive devices by those who had studied the situation. I think that our investigations have uncovered one of the principal reasons why this was true. Think of it. An average of three out of every four prophylactics sold contained holes and, in some instances, 93 out of 100 were defective.

We found that there was never a depression in this industry. Factories run night and day, seven days a week, and sales are constantly on the increase. We found that over one million mechanical prophylactics are used daily in the United States and the public pays more than $50,000,000 annually for them. After the survey had shown such serious conditions, the Food and Drug Administration began regulatory action and in a short time seized more than one and three-quarters million of such mechanical prophylactics, including rubbers and skins, but mostly rubbers, on the charge that they were misbranded because the articles were labeled or purported to be disease preventives when in fact they were ineffective for this purpose.

Our investigations show that the principal cause of defects in rubber prophylactics is the dust particles which fall on the liquid latex while they are being dried on forms. When the rubbers are completely dried, these dust particles will dislodge, leaving a hole where each particle had previously been. Our seizure

actions became so extensive that the manufacturers could no longer do business since most of their output was at once apprehended by the Federal Government. Therefore, after a short time the principal manufacturers closed their plants to effect extensive physical changes in building, equipment, and manufacturing processes. In some instances the manufacturers who had been driven by a bad competitive situation welcomed our action and gave us splendid voluntary cooperation. The principal solution of the problem was to so thoroughly filter the air applied to dry the liquid latex while on the forms, as to prevent all dust damage. We believe all manufacturers in the industry, except a few small hand-dipping operators, have installed machinery wherewith the drying air is filtered through water. The second solution is to so thoroughly and carefully test the articles as to eliminate defectives from commercial lots. All manufacturers have improved testing methods. The objective to correct the deplorable conditions in the industry to insure effectiveness in disease prevention has been largely achieved. Our present examinations show the better grades running nearly 100% without holes. Defective prophylactics in material amounts are found now principally in "Seconds," that is, rejects sorted out on testing. Such "Seconds" are now sold more generally for export to South American countries, but many lots find their way into domestic commerce. The Administration is lending every effort toward apprehending all such shipments.

Perhaps you will be interested in a few comments on this law. First of all, and most important, let me say that neither the law nor the regulations nor our administrative interpretation nor what I am telling you has very much significance until the courts have clarified and interpreted its provisions.

I mentioned before that the Act does not contain jurisdiction over advertising. The Act is also not designed to regulate the practice of medicine or any of the healing arts. In my opinion, we will probably not be able to touch those cultists, faddists and others who lay claim to be practicing one of the healing arts and employ in such practice therapeutic devices. The regulation of these lies within the jurisdiction of the States and municipalities. However, the law impinges on this field and I can assure you that we will go as far as the courts permit us in extending the protection of the Federal Food, Drug, and Cosmetic Act to the general welfare. In the discharge of our duties in the enforcement of the Act we have had an unusual opportunity to see the operations of cultists, faddists and quacks of various kinds. In my judgment, these ignorant or misguided or dishonest cultists are a serious menace to the public health. Not infrequently they employ expensive devices, both diagnostic and therapeutic, to impress those who have been attracted by their gold brick promises of cure. In other situations we find practitioners of various so-called healing arts who have been licensed to practice their arts by State legislatures stepping out beyond the bounds of their authorized sphere. They employ such devices as x-ray machines, endothermy, diathermy, cautery and other devices for which we all recognize special training and skill are necessary. The situation is serious. Many States appear to have very little interest and practically no machinery or appropriation to properly enforce their various medical practice acts. In some States the legislatures appear to be duped by the representations of these quacks. I call this to your attention because I think that responsible groups of physicians must take a more active and aggressive lead in opposing these parasites. In these matters laymen do not even know when they are victimized and exploited. It is up to you to educate them. No one is in better position to sponsor legislation to protect the public. It is up to you to oppose vigorously the enactment of State laws that are not in the public interest in this field and, above all, you should bear down on the enforcement agencies to see to it that the quacks are prosecuted and give your full cooperation once such actions are begun.

The Food and Drug Administration is a small organization. It has had a continuity of service in administering the law of the land on foods and drugs since 1906. Its employees, from the Commissioner of Foods and Drugs down, are in the Civil Service. The organization was recently transferred from the Department of Agriculture to the Federal Security Agency which, with the Public Health Service and other public health and welfare units, is perhaps a more natural native habitat for our work. The protection of the public from injury and deception in the fields of foods, drugs, devices and cosmetics is at once a grave responsibility and a prodigious task. We cannot do it alone. We are vitally dependent upon experts in every field for facts, observations and opinions. Congress has not provided us with facilities nor the personnel to make clinical tests of devices ourselves. We are dependent upon the reports of your experiences and your cooperation in applying science to our task. When you see injuries resulting from dangerous devices, we hope that you will report them in the literature or directly to us. We must have access to case records and when we take steps to protect the public against dangerous or adulterated or misbranded devices, we expect that we can count on you for help and we believe that it is your civic duty as a good citizen to place your special talent at the disposal of your Government. The Food and Drug Administration has always, as a matter of fairness and good government, spared no effort to avoid imposing on physicians. We cannot pay you adequately for the time you give us, but we never ask you to appear at legal proceedings without defraying the cost of your basic expenses and furnishing the standard honorarium or witness fee that has been set for this purpose. This witness fee has been $25.00 a day, which is not much but is at least some recompense for your devotion to the public good.

The influence of the work which we are doing is not altogether limited to goods moving in interstate commerce, which is the constitutional sphere of our authority. A number of states have adopted their own Food, Drug, and Cosmetic Acts patterned after the Federal law. There is reason to believe that many more will do likewise. We have found that in many instances the States, and even some municipalities, follow up the steps we have taken with parallel actions. It is, therefore, all the more important that the work we do is thorough, well advised, and scientifically sound.

In closing, I want to say that the protection of the public from dangerous or deceptive devices is your task as well as ours, and between us we should be able to make the beneficient Federal Food, Drug, and Cosmetic Act an important influence for good in this country.

Discussion

Dr. Richard Kovács (New York): It is most gratifying that in this afternoon's program we had the participation of two of our Government agencies, and it speaks well for the future of physical therapy, that we can discuss our problems and plan to cope with them in such a cooperative way. The new Food and Drug Act Dr. Klumpp refers to opens up a new vista of possibilities for the protection of the public, since the Government now can legally check on any electrical or mechanical treatment device. It should enable the halting of some of the rank abuses that have been going on for some time.

We can accept the axiom that any therapeutic device that is powerful enough to do good can do harm, if it is improperly applied, and as a corollary that any therapeutic device that cannot do any harm cannot do any good. It is evident that many mechanical and electrical devices if put into lay hands, may be dangerous, and it is up to the agencies of the Government to see that the public is protected.

I have had two first-hand experiences with some of these conditions, very recently, the first of them rather amusing. One low-frequency device, simply using the alternating current with a little surging device, has been extensively advertised to the public for self-treatment of a great number of ailments — something like the old patent-drug-rackets — from falling hair to fallen arches. I was first asked by the Federal Trade Commission to give expert advice about this device, and it was my privilege to serve the Government and state the worthlessness of that contraption. To my great surprise the manufacturers of the device then asked for my expert opinion to review these findings. After receiving the permission of the Federal Trade Commission, I became a paid ex-

pert for repeating the same opinion. The device is now off the market.

In another case of a small vibrator that has been marketed for massage purposes, the high-class advertiser asked for advice so as to enable him to limit his advertising to fully acceptable statements. So there is no question but that these new legal restrictions will mean a great deal in protecting the public and will also give the medical profession an opportunity to cooperate in stopping some of the more rank abuses of former days.

It is very regrettable on the other hand that such a flagrant abuse as the extensive advertising of diathermy apparatus for self treatment by the laity still can go on apparently without any legal check. This situation seems to be entirely due to legalistic handicaps of municipal, state and government agencies, and has given the protection of the public a black eye and to the medical profession a merry run around. Unscrupulous vendors of cheaply manufactured diathermy machines advertise these boldly for the pains of arthritis or neuritis or lumbago or pneumonia, or bronchtis and hand them to an ignorant lay person who doesn't know how to use them. We know how relatively few of our medical men who bought machines from the manufacturers know how to operate them satisfactorily and efficiently. When the same machine is used without any control by a layman, it becomes dangerous. Yet such bold advertising has been going on for years in New York City over the radio and in some of the newspapers and no one has seemed to be able to stop it so far in spite of cases of apparent violations of the medical practice act and burns, duly reported to the authorities. Our only hope in this situation is perhaps the new Food and Drug Law, but even here there seems to be a handicap for Dr. Klumpp says if there is no interstate shipment of these machines, the Federal Government cannot do anything. Gentlemen, we are in a democracy, but we sometimes wish we had an autocrat who could make a clear sweep among the too many laws protecting the constitutional rights of rascals and affording no real protection to the public.

Dr. William Bierman (New York): The quack and the seller of drugs and of apparatus to the laymen for self treatments have always been with us. Everybody knows that these gentry are concerned solely with the removal of money from the gullible. By direction or misdirection they have done harm to an untold number of victims. Unfortunately, technological progress in the treatment of human ills has not been paralleled by any improvement in human gullibility. The practitioners of medicine clearly recognize this evil. They find themselves in the position where they cannot expend the necessary detective and police effort to remedy it. Society must do that for itself, through those whom it empowers to supervise its welfare. The governments in Europe appear to have recognized and acted upon this responsibility long before our own. We are belatedly making this effort in the manner which Dr. Klumpp has called to your attention. This effort has not as yet gone very far. Today, for example, it seems to be legally permissible for any one to sell a diathermy or short wave current machine to the cancer sufferer, who has a so-called "neuritic pain" so that he can prevent himself from seeking medical attention until his tumor is unremovable, to the arteriosclerotic, so that he can give himself a painful and very slow healing burn, and to the possesser of a so-called "bronchitis" so that he can die of his tuberculosis.

We hope that government action now launched in the right direction will go a little further so as to prevent the liberty extended to an individual to become the license to maim and kill his fellow men.

Mr. Howard A. Carter (Chicago): The cooperation of the Food and Drug Administration of the Federal Trade Commission has been most cordial in the past with the various departments of the American Medical Association and this cooperation is continuing at the present time. The Council on Physical Therapy appreciates this cooperation.

The Home Diathermy Apparatus was mentioned. It is a small short wave diathermy apparatus marketed in New York and it among several others is not on the accepted list. Reports on this device and others may be obtained from the Council. I should like to ask Dr. Klumpp one question. Does the Food and Drug Administration insist upon evidence being supplied by the manufacturer of the device, or does the firm insist that the Food and Drug Administration produce the evidence? In some instances, I am informed, promoters of devices such as used by Abrams, and subsequent quackery, will insist the organization prove that the apparatus will not work rather than give evidence that the apparatus is efficacious. In the work of the Council on Physical Therapy the burden of proof rests on the manufacturer. Does the burden of proof rest on the manufacturer in the case of the Food and Drug Administration, or is it up to the Administration to produce the evidence?

Dr. Frank H. Krusen (Rochester, Minnesota): I wish to confirm Mr. Carter's statement concerning the excellent cooperation that has been given to the medical profession by Dr. Klumpp and by Mr. Jett in the problems that are of mutual interest. Just a few months ago, Mr. Carter and I visited Dr. Klummp's and Mr. Jett's office in Washington, and we were delighted with the way they met us more than half way in discussion of mutual problems.

I should like to correct one impression that may have been gathered here about Dr. Klumpp. Dr. Klumpp is a doctor of medicine; and, therefore, he is thoroughly acquainted with and sympathetic toward the problems of the physician.

Dr. Theodore G. Klumpp (closing): I can fully appreciate the reasons why Dr. Bierman feels discouraged about eliminating from our national scene all of the quacks, and particularly those that he has had contact with. But we must keep in mind one thing. We are a democracy, and all our laws are designed to safeguard and respect the rights of the individual. I know that Dr. Bierman would never want the Federal Government to act in a bureaucratic manner, or any of the states or local governments to act in a bureaucratic manner and impair the civil liberty or the civil right of any individual. Well, we pay a price for that. We pay a price for our liberty, and that is that we are a little less efficient. We are slower in driving from the temple the money-changers. We have to proceed along the line of the law, according to the written word of the law. We must not only regard that, but we must regard the constitutional rights of the individual against whom we are proceeding.

Now on the diathermy machines that have been under discussion, we, through the kindness of Dr. Bierman and Dr. Kovács, found out about them, and we made an investigation. We sent inspectors to the plants of two of the concerns that are principally guilty of selling them to the laity. We have no doubt at all that they are dangerous when sold to the laity, but our inspectors who have sat on the tails of these concerns have been unable to obtain any proof of interstate commerce. You might say, "Well, why not send for one of these machines?" If we were to send for a machine in New Jersey, let's say, and act against the machine on that basis, that would constitute entrapment, and neither you nor I want any of our federal agencies to entrap an individual to commit a crime, so that we are watching for a voluntary shipment across the state line, and when we find that I assure you we will proceed against the concerned manufacturers.

That brings up another thing. I have been rather frank in discussing our various responsibilities here. I do want to re-emphasize that it is my judgment, and it is the judgment of many others who have seen the operation of our various laws, state, federal and municipal, that the state authorities and the municipal authorities are not being sufficiently driven into a proper discharge of their responsibilities.

I would like to make a suggestion about these diathermy machines. That suggestion would be that you have your attorneys review your evidence that these machines are dangerous when sold to the laity, that you have your attorney review the state law and come to an opinion about that, and advise you whether or not, in his judgment, the manufacturers violate any State or Municipal Act. If they do, you can send that opinion to your local authorities, and believe me, if I know law enforcement officials, they cannot ignore a representation of that character.

Mr. Carter asked essentially, when we investigate a machine or any other article that comes under the jurisdiction of the law, who has to produce the evidence? The answer to that again is that we are operating in a democratic fashion, and it is up to us to prove, beyond a reasonable doubt in criminal cases and by a preponderance of evidence in seizure cases, that this device or that manufacturer has violated the law. We cannot of course ask the cooperation of the manufacturer in proving himself guilty.

Now on the home diathermy machine, I can say that we know, as a matter of fact, that the manufacturer, in his own automobile, has carried one of these machines across the state line. How are we going to prove interstate shipment? We can prove it only on his own testimony, and that testimony would incriminate himself, and he is not required by our constitution to testify against himself, so that shipment went by the board.

About contraindications that are required on the labeling or in the labeling of devices that are shipped to physicians, we are obeying the law. We didn't make the law, but we have to enforce it. The law makes no exemptions whatsoever for devices that go to physicians or anybody else. As a matter of fact, I think in the long run that is probably a good idea because, again, the law will not permit itself to discriminate between the physician and the cultist who professes to practice a healing art, if he is licensed by the state. You know, there are plenty of phony licenses for various cults in our states.

The law states that every device must bear adequate directions for use and adequate warnings against possible misuse. I think the answer to that, Dr. Coulter, rests in the definition of the word "adequate," and I can say for the Food and Drug Administration, that something less than would be necessary for the layman will be adequate for the device that is shipped to the physician, but that adequate directions and adequate warnings may all be included in pamphlets distributed with the machine. Just exactly what is something less, we will have to decide when we have the pamphlet submitted, in going over it.

[NOTE: Regulations exempting devices and drugs intended to be used by physicians or on physicians' prescriptions, from bearing adequate directions for use under certain conditions have been proposed since this talk was given. It is expected that these will be promulgated before these comments are published.]

Dr. Coulter: It does not have to be on the machine?

Dr. Klumpp: No, such a requirement would be quite unreasonable.

PRESENT STATUS OF SHORT WAVE DIATHERMY IN NASAL SINUSITIS *

A. R. HOLLENDER, M.D., F.A.C.S.

MIAMI BEACH, FLORIDA

Short wave diathermy has been employed for all sorts of conditions in the belief that it would fill the gap caused by the failure of other measures. While this opinion was first held in several other specialties, it was not long before it became manifest also in otolaryngology.

The early enthusiasm for short wave therapy of nasal sinusitis has greatly subsided. This is true especially in those instances in which the rhinologist has endeavored correctly to evaluate this newer agent. Increased clinical experience from added data has thrown considerable new light on the subject enabling those who have adopted the measure as a routine to apply it more scientifically.

It is not denied that short wave diathermy, through its deep heating qualities, serves a definite purpose in the treatment of inflammatory processes. Its general use in nasal sinusitis, however, without proper selection of cases, and dependence on its application exclusive of other accepted measures, have had a tendency to place this otherwise valuable therapeutic agent in the class of debatable procedures.

Technical Aspects

It hardly needs stressing that the technics depend on the particular sinus to be treated.[1] The frontals and maxillaries lend themselves to this management without difficulty, but as with conventional diathermy, the posterior sinuses are little if at all influenced by short wave procedures. Whether heating of the posterior sinus areas can be effected has not been proved experimentally. Clinical trials in large series of cases have failed to show improvement either in the acute, subacute or chronic forms of ethmoiditis or sphenoiditis.

The large variety of electrodes on the market, the claims that one kind is superior to the other, and the positive assertions of some workers that the clinical value of apparatus is greatly enhanced by certain wavelengths, have confused physicians in general and rhinologists in particular, so that there is need for clarification of the present status of short wave diathermy in sinus therapy.

From the clinical standpoint, so far as the accessory nasal sinuses are concerned, it seems to make little or no difference whether air-spaced, rubber condenser electrodes or the electromagnetic field with cable are used. Trials on several hundreds of patients have convinced me that the main difference lies in the kind of technical application. Treatment of any of the nasal sinuses is greatly facilitated by air-spaced electrodes fixed to flexible arms attached to the apparatus. Certainly there is no proof, irrespective of the apparatus, electrodes and technic employed, that short wave diathermy possesses peculiar physiologic or biologic properties affecting cellular life.

In nasal sinusitis correct technic of application is essential for effects which may be anticipated on the basis of experience. The tendency to apply electrodes incorrectly not only causes failures even in properly selected

* Read at the Nineteenth Annual Session of the American Congress of Physical Therapy, Cleveland, Ohio, September 3, 1940.

cases, but occasionally leads to skin burns. While these effects are uncommon in experienced hands, they have occurred. There must be no careless supervision on the part of the physician himself or his assistant or technician. Every effort should be made to learn the characteristics of one's apparatus and electrodes.

Selection of Cases

In a previous communication[2] I pointed out that short wave diathermy is not in itself sufficiently effective in acute sinusitis to be employed to the exclusion of other recognized procedures. I also deduced from clinical studies that it is not a curative method for chronic sinusitis when used either alone or in combination with other nonsurgical measures. These studies proved, however, that short wave diathermy is an effective aid to indicated accepted procedures in acute sinusitis, hastening the abatement of symptoms and shortening the course of the disease.

The claims of certain clinicians that this agent is a sure cure for sinusitis in general must be denied. The irrationality of applying short wave diathermy to a hyperplastic sinus is at once appreciated. Yet there are instances on record where such treatment has been carried on for indefinite periods. Likewise, typical allergic sinusitis is unfavorably influenced by local heat. Experience has shown that the symptoms are aggravated and relief subsequent to the usual methods are more difficult to obtain.

Chronic inflammatory sinusitis does not respond to short wave diathermy, whether this agent is used alone or employed merely as an aid to orthodox nonsurgical measures. Too many patients with sinusitis are treated by general practitioners or specialists in physical therapy without a correct diagnosis having been made, with inevitable failure. Here it should be emphasized that while there is no objection to treatments being given by these practitioners, cooperation with a rhinologist for diagnosis and checkup of progress is highly important. Those types of sinusitis which have been found to respond unfavorably to short wave diathermy should not be subjected to this treatment.

It has already been stated that the method has a place in the management of acute sinusitis, but here it should be stressed again that such treatment in itself usually proves inadequate until measures are instituted to effect improved ventilation and drainage, after which diathermy will shorten the course of the disease. The omission of standard measures in acute sinusitis, whether intentional or otherwise, and the use of short wave diathermy exclusive of other recognized procedures are nothing short of ignorance and smack of charlatanry. The rhinologist must select his cases with the greatest care, if this newer physical agent is to prove of any scientific value.

Postoperative Use of Short Wave Diathermy

At the time of my previous report I had followed up a number of patients with chronic maxillary sinusitis who had been subjected to surgical procedures (window resection or Caldwell-Luc operation) without complete improvement. The causes for lack of favorable response were not always apparent nor could they always be determined. These patients were operated by other surgeons. Since this report was published I have collected 21 such cases in which I have tried the systematic application of short wave diathermy. It should be noted that they were also subjected to irrigation and to other customary procedures. In 12 of these, the customary procedures were continued, but short wave diathermy was added, while nine received short wave diathermy as the sole postoperative measure. In the first group after three months of intensive treatment three showed moderate improve-

ment, while the remaining nine remained uninfluenced. In the second group which received diathermy alone not a single case revealed a favorable change. One must therefore conclude that, like in acute sinusitis, if short wave diathermy is to be employed postoperatively, conventional measures must under no circumstances be omitted from the scheme of treatment.

As these operated cases were all of the chronic variety, the failures were not at all surprising. The information gained discounts the value of short wave diathermy as a postoperative measure whether employed as an aid to other procedures or applied as the sole therapy.

Causes of Failure

While heat has always been employed in the treatment of inflammatory processes, and has been advocated more or less at random in all types of nasal sinusitis, the time has come when such empiricism is no longer justified. Sufficient clinical experience has been gained to state that heat in any form is valueless in the chronic forms of sinus disease. In acute sinusitis, however, the application of local heat to an affected sinus is good therapy. Short wave diathermy is superior to other local heating agents because it creates heat at much greater depths than conductive and convective sources and even the older long wave diathermy. In acute sinusitis the short wave type relieves pain and discomfort and enhances the effects of topical and systemic measures.

In acute exacerbations of chronic sinusitis short wave diathermy is justifiable for the same reasons. Beyond this indication in chronic sinusitis, heat from any source is ineffective and time-wasting.

Inflammation as a natural reaction in repair of disease processes should under ordinary circumstances hold good in chronic sinusitis as it does in acute sinusitis. Why it acts otherwise in the latter can be attributed only to the fact that the tissue changes are fixed and beyond the stage of local influence. In acute sinusitis deep heat stimulates the flow of lymph and when such heating is prolonged, edema ensues. It is believed that the infection is controlled by the very increase of the inflammatory process. In chronic sinusitis the fixed tissue state is unresponsive to this same reaction. It is probably for this reason that local deep heating by short wave diathermy fails in clinical effect.

Comment and Conclusions

I have already pointed out the lack of proof that short wave diathermy possesses mysterious biologic effects apart from its thermogenic property. I have also suggested on several occasions that dosage is as yet unsettled and that present methods of application for the nasal sinuses produce little or no difference in clinical effects. There is no conclusive experimental or clinical evidence that short wave diathermy is the curative aid we had hoped for in chronic sinusitis. Even when cases are properly selected, improved results with this aid are observed only in the acute forms of nasal disease.

There is no doubt that local heat will frequently relieve pain. There is also no doubt that of all local heating agents for sinusitis short wave diathermy is the measure of choice. For purposes other than the relief of discomfort and the promotion of drainage, it serves no useful purpose. These symptoms, occurring as they do in acute bacterial forms of sinusitis, yield best to short wave diathermy when it is employed as an adjuvant to shrinkage, suction, irrigation, and the like. The acute exacerbations of chronic sinusitis should be managed in the same way as primary acute sinusitis. As a postoperative aid in sinus disease which has not responded to surgical procedures, short wave diathermy has, in my opinion, no remedial value.

From all experimental work and close clinical observations, one must come to the conclusion that short wave diathermy has a place in the treatment of acute sinusitis, but that it is insufficiently effective in itself to replace classic procedures in this condition and in chronic sinusitis.

It should be restricted to that selected group of sinus disease in which favorable results may confidently be anticipated.

Summary

1. The scientific utilization of short wave diathermy for nasal sinusitis presupposes careful selection of cases.

2. From the standpoint of clinical effect, when short wave diathermy is indicated in nasal sinusitis, there seems little or no difference whether air-spaced electrodes, rubber condenser electrodes, or the electromagnetic field with cable are used, so long as correct technic is followed.

3. It is reiterated on the basis of more extensive studies that short wave diathermy is of value as an aid to indicated procedures solely in acute sinusitis.

4. Allergic sinusitis and hyperplastic sinusitis are contraindications to local heat in any form.

5. Observations on the value of short wave diathermy as a postoperative aid have been disappointing, demonstrating more conclusively the futility of applying this agent in chronic sinusitis.

6. While the empiric use of heat in any form is irrational in chronic sinusitis, short wave diathermy because of its deep heating qualities is sound therapy in acute exacerbations of this condition for relief of pain and improvement of drainage.

7. It is probable that short wave diathermy fails in chronic sinusitis because of fixed tissue changes which do not yield to most local nonsurgical procedures.

References

1. Hollender, A. R.: Clinical Evaluation of Short Wave Diathermy in Otolaryngology, Eye, Ear, Nose & Throat Monthly **16**:410 (Jan.) 1938.

2. Hollender, A. R.: Short wave Diathermy in Treatment of Nasal Sinusitis, Arch. Otolaryn. **30**:749 (Nov.) 1939.

Discussion

Dr. Paul M. Moore (Cleveland): I am sure Dr. Hollender has covered the subject so thoroughly that there is very little I can add. He has presented a clear and concise evaluation of the merits and shortcomings of short wave diathermy in nasal sinusitis. Such an evaluation is necessary before we can intelligently and scientifically use any therapeutic agent. In my own experience the results have been much the same as those he has reported.

Short wave diathermy is merely a means of producing heat in the tissues, but because of its greater penetrating powers, it is superior to other methods. Heat, whether produced by this means, by an infra-red lamp, or by an open oven is definitely beneficial in acute sinus infection and in acute exacerbations of chronic sinus infections.

I would like to stress two points the essayist has mentioned. One is the necessity of selecting the proper cases for treatment with diathermy. The other is that even in properly selected cases diathermy alone is of very little value. It must be used in conjunction with other accepted local and general measures.

Best results are obtained if a nonirritating preparation of ephedrine, ephedrine substitute, or cocaine is first placed in the nose. This can be done by drops, atomizer spray, or by direct application on soft cotton nasal packs placed well up in the middle meatus. Personally I prefer the latter when it can be done, because it results in a more prolonged action of the drug. The heat should be applied while this medication is acting on the membranes of the nose. In this way the full effect of both therapeutic agents is obtained.

Dr. Disraeli Kobak (Chicago): I should like to ask the last discusser to explain the rationale of applying ephedrine to the nose as an astringent and applying at the same time some form of heat which tends to cause nasal evisceration.

Dr. Moore: Theoretically that is quite a poser but practically it does work. If you get the nasal membranes shrunken down, that is in the nasal chamber itself,

you get much better drainage from the sinus. Why it works that way I don't know. I have used heat without ephedrine and the relief was not comparable to that when ephedrine was used. I can't explain the theoretical side.

Dr. W. H. Schmidt (Philadelphia): There are a good many things in Dr. Hollender's paper we must all agree with. In the first place it is essential to have the correct diagnosis. In the second place, it is very foolish for anyone to try to cure everything that comes along with just one form of treatment. I think everything that is of any value certainly ought to be used in the treatment of these conditions. I have treated a great many cases of sinus infection and in all of them we have used some form of additional treatment, particularly the Caldwell-Luc method and other types along with short wave diathermy. Where we have had conditions of anatomic interference with drainage, they have been corrected, but I can't really agree with him that you don't improve a chronic sinus condition. Perhaps I am not as competent to judge as a rhinologist, but when patients assert they are so much better and that they have had all sorts of nose and throat treatment without benefit, I don't know what we are to believe. My impression is that short wave diathermy in the hands of those experienced with the procedure represents a valuable adjuvant even in chronic sinusitis.

Dr. A. R. Hollender (closing): I think the problem resolves itself into one of diagnosis. Too many patients with complicated sinus conditions are subjected to short wave diathermy, when other treatment is indicated. For example, hyperplastic ethmoiditis will not yield to short wave diathermy. In fact diathermy treatment is contraindicated in such a case. It will frequently aggravate the symptoms. It is unfair to have these patients believe that diathermy will help the condition.

In some of the milder forms of subacute sinusitis short wave diathermy may be of some help, but the line of demarcation between acute and subacute is sometimes difficult to make.

One cannot report any more than his own observations. I do not now have the enthusiasm for the effectiveness of short wave diathermy that I had a few years ago. A wider experience has taught me to be more conservative about predicting results with its use. With justice to myself I must say, however, that I never expressed overenthusiasm.

The claims of some clinicians that short wave diathermy is a cure-all for chronic nasal sinus disease cannot be substantiated. Its indiscriminate application has led to unwarranted prejudice toward an otherwise valuable therapeutic agent. As I have stated in my paper, short wave diathermy should be restricted to acute and subacute forms of sinusitis. In these cases it has a place and augments other treatment. But in chronic sinusitis, at least in my experience, heat in any form is valueless. This excepts, of course, acute exacerbations which require the same measures as the acute conditions.

EFFECT OF HYPERPYREXIA ON THE BLOOD pH *

STAFFORD L. OSBORNE, M.S., Ph.D.

Assistant Professor Physical Therapy, Northwestern University Medical School

CHICAGO

Several reports have appeared on the effect of an elevation of body temperature on the pH of the blood. Haggard[1] in 1920, experimenting on himself found a distinct lowering of the CO_2 tension after twenty minutes in a very hot bath. As no corresponding fall in the CO_2-combining power of the blood was found, he suggested that a change in the reaction of the blood had taken place. This suggestion was verified by the direct measurements of Koehler[2] in 1923. He showed that the acid-base equilibrium shifted toward the alkaline side not only during acute clinical fevers, but also during a "pure thermic fever," as he designated it. He secured his "thermic fever" by immersing four subjects in a hot bath for a maximum period of thirty-seven minutes. The oral temperature ranged from 103.2 to 105.3 F. and the change in blood pH was from a minimum of 7.365 to a maximum of 7.605. In the same year Cajori, Crouter and Pemberton[3] studied the effect of heat on acid-base balance. These workers exposed fifteen subjects to the heat of an electric light cabinet, from which only the head protruded. They were exposed to this heat for a period of forty to fifty minutes, but neither oral nor rectal temperature was recorded. They state that the temperature of the skin reached 120 to 130 F. after twenty minutes. The pH values of the height of the temperature was from 7.24 to 7.55, a change of —0.03 to —0.26 point. Several other groups of investigators have reported rises in pH of the blood associated with artificial fever, the elevation of pH ranging from 7.43 to 7.7.[4, 5, 6, 7, 8]

The observations just referred to were for the most part carried out chiefly on normal individuals. In the majority of the cases the fever attained was not held for any appreciable period of time. It was, therefore, thought advisable to study pH changes of the blood of patients while undergoing artificial fever therapy.

Method of Investigation

Determinations of the blood pH were made on ten patients subjected to fever therapy for the treatment of infectious arthritis. The patient's temperature was raised by a combination of the inductotherm and an insulated metal cabinet. Rectal temperature was elevated to 104-105 F. and maintained at that level for four hours, and then permitted to return to normal. Fluids were given by mouth as needed and consisted of 0.4 per cent salt solution.

Blood samples were drawn with the usual precautions from the median basilic vein of the arm. With the hypodermic needle in place the syringe was removed and replaced by the Dole glass electrode. The inflowing blood displaced a small amount of sterile distilled water from the glass electrode, and by this means prevented the blood from making contact with the air. The pH determinations were read directly by a Coleman potentiometer. The instrument was calibrated against a known standard at the beginning and the end of each experiment. Determinations were not accepted that could not be duplicated with an error of less than pH 0.01. Determinations were made prior to starting the treatment, when the rectal temperature reached 104 F., and again, at the end of the four-hour temperature maintenance

* Aid by a grant from the Council on Physical Therapy of the American Medical Association.

period, and finally when the patient's rectal temperature returned to normal. Thirty-three experiments were performed.

The results are recorded in table 1. Table 2 gives a complete summary of the data. Table 3 gives a summary of the work completed by other investigators as well as our own.

The pH of the blood for the control period at the beginning of the experiments ranged from 7.30 to 7.52, the average value of all the determinations being 7.415 ±0.01. When the rectal temperature reached 104 F. the pH was elevated, showing a range of 7.35 to 7.72 with an average value of 7.55 and a standard error of ±0.016. After four hours of temperature maintenance, the pH range was from 7.30 to 7.83, the average for the period being 7.52 with a standard error of ±0.0197. When the temperature returned to normal the pH values decreased to approximately their control levels, the range being 7.32 to 7.51 with an average value of 7.418 ±0.0095.

TABLE 1. — *The Effect of Artificial Fever on Blood pH — Complete Data.*

	Before	Ht.	4 Hrs.	After
An.	7.43	7.56	7.41	7.41
An.	7.46	.....	7.63	7.47
Ak.	7.39	7.35	7.30	7.37
Ak.	7.48	7.72	7.52	7.48
Ak.	7.45	7.53	7.53	7.48
Ak.	7.43	.....	7.48	7.44
Ak.	7.39	7.35	7.30	7.37
Ko.	7.52	7.61	7.52	7.40
	7.52	7.61	7.46	7.50
	7.46	7.58	7.42	7.51
	7.48	7.66	7.49	7.41
M	7.50	7.51	7.57	7.50
	7.41	7.62	7.55	7.40
	7.30	7.60	7.62	7.42
	7.40	7.61	7.63	7.46
	7.30	7.70	7.40	.....
O	7.41	7.51	7.83	7.39
	7.39	7.56	7.51	7.44
	7.46	7.57	7.53	7.42
A	7.40	7.49	7.50	7.33
	7.35	7.44	7.40	7.37
B	7.32	7.50	7.49	7.32
	7.42	7.50	7.49	7.42
	7.35	7.48	7.44	7.35
	7.36	7.50	7.42	7.34
Uk.	7.34	7.49	7.49	7.35
	7.39	7.62	7.59	7.40
G.	7.48	7.65	7.71	7.47
	7.41	7.66	7.70	7.44
	7.40	7.45	7.61	7.39
	7.41	7.62	.....	.....
K.	7.39	7.54	7.49	7.43
	7.50	7.62	7.59	7.50
Averages	7.415	7.55	7.52	7.418
σ ±	0.01	0.016	0.0197	0.0095

Discussion

It is apparent from the data obtained that artificial fever causes a significant elevation of the blood pH. Cajori, Crouter, and Pemberton[3] believe that the increase in alkali reserve is caused by a migration of base from the tissues into the blood. The loss of CO_2 by the body through the lungs and sweat during the fever is undoubtedly of prime importance in increasing the alkalinity of the blood. The skin is a path of CO_2 loss of some importance. These investigators state that three to four per cent of the total CO_2 lost during a period of raised body temperature and active sweating is eliminated by the skin. Koehler[2] seems to think there is a direct correlation between

TABLE 2. — *Summary of Blood pH Data.*

	pH Minimum and Maximum	Averages of 33 Determinations	2 σ Diff. ±	Increase Over Control Period
Control	7.30—7.52	7.41	.....	.....
Temperature at 104 F.	7.35—7.72	7.55	0.038	0.14
End of 4 Hours of Temp. at 104 F.	7.30—7.83	7.52	0.0396	0.11
Normal Temp. Return	7.32—7.51	7.418	0.028	0.003

TABLE 3. — *Summary of Data From Various Investigators — Blood pH.*

Investigators	Method used for elevating body temperature	Body Temperature	Minimum and Maximum Blood pH	Methods of pH Determination.
Koehler 1923	Hot water bath 37 min.	Oral 103.2—105.3 F.	7.365—7.605	Hydrogen Electrode.
Cajori, Crouter & Pemberton, 1923	Electric light cabinet 40-50 min.	Not given	7.24—7.55 Increased 0.03 — 0.26	Computed from CO_2 absorption curves 4 by Colorimetric method of Cullen.
Landis, Long, Dunn, Jackson & Meyer, 1926	Hot water baths, 2 hours	39.2 40.4 C.	7.56—7.74 Increased 0.12 — 0.33	Colorimetric method of Cullen.
Bischoff, Ullman, Hill & Long, 1930	Conventional Diathermy 1½-3½ hrs.	Oral 37.2—39.4 C.	7.52—7.70 Ma. Increase 0.23	Quimby drove Electrode.
Hopkins, 1934	Hot water bath, 30-45 min.	105—106 F.	7.43—7.55 Increased 0.02 — 0.16	Colorimetric Method of Hastings and Sendroy.
Danielson & Stecher, 1935	Kettering Hypertherm	104 F. 2-4 hours	Elevated, No figures given	Not given.
Osborne, 1940	Inductotherm	104 F. Rectal maintained 4 hours	Averages 7.55 at 104 F. 7.57 after 4 hours Maintenance Increased 0.14 — 0.11	Coleman Potentiometer & Dole glass electrode.

cyanosis and certain types of alkalosis. We find that cyanosis is not an uncommon occurrence in patients undergoing fever therapy. It probably indicates cardiac embarrassment. Koehler believes that the fever alkalosis is due to the increased lung ventilation and the rapid elimination of CO_2 from the blood, thus causing a CO_2 deficit, which in turn results in the passage of Na ion into the tissue fluids and partially into the urine. On the other hand, Landis, Long, Dunn, Jackson, and Myers[8] do not believe that hyperventilation is the sole cause of the change in pH, but is probably dependent on several factors, such as the kidneys, the degree of sweating, and lactic acid formation. The latter factor, they seem to believe, may be of some importance in some cases. In one of their tables they show that the greatest change in pH occurred with the least hyperpnea, and the smallest change in pH with the greatest ventilation. They state that there is a much closer relationship between blood pH and the alveolar CO_2. These investigators used hot water baths as a means of raising the body temperature and encountered tetany in most of their subjects. In the period of tetany, there occurred on two occasions when two blood samples were taken during the stage of severe symptoms, a fall of pH with a simultaneous fall in CO_2 content. This, they point out could only be due to an organic acid such as lactic acid formed by the tissues and poured into the blood stream. Bischoff and co-workers[4] found that the greatest changes in pH occurred with the greatest degree of hyperpnea.

Bischoff, Ullmann, Hill and Long[5] as well as Cajori do not agree with Koehler that an anoxemia exists in the presence of a fever alkalosis. They found that there is always an increase in pH of the blood. As a result of the lowered CO_2 tension in the blood, and increased pH, the stability of the oxyhemoglobin increases. If the circulation and the metabolism did not increase at the same time, the question would be quite simple. With an increase in circulation, however, the tissues are exposed to more blood per unit of time, so that the effect of the stability of the hemoglobin might be offset if the demand for more oxygen due to increased metabolism were not too great.

Conclusions

1. Thirty-five experiments were made to ascertain the changes occurring in the blood pH of ten patients while undergoing artificial fever therapy for chronic, infectious arthritis.

2. A rectal temperature of 104-105 F. was secured and maintained for four hours during each experiment and then permitted to return to normal.

3. Artificial fever produced by physical means elevated the blood pH in the absence of tetany and cardiac embarrassment.

4. The average pH value of 7.55 found at a temperature of 104 F. would seem to indicate a state of uncompensated alkalosis.

5. With a return to normal temperature there was a return of the blood pH to its former level.

References

1. Haggard, H. W.: Hemato- Respiratory Functions. The Alteration of the Carbon Dioxide Ratio in the Blood During Elevation of Body Temperature, J. Biol. Chem. **44**:131 (Oct.) 1920.

2. Koehler, A. E.: Acid-Base Equilibrium. I. Clinical Studies in Alkalosis, Arch. Int. Med. **31**:590 (April) 1923.

3. Cajori, F. A.; Crouter, C. Y., and Pemberton, R.: Effects of Heat on Acid-Base Balance, J. Biol. Chem. **57**:217 (Aug.) 1923.

4. Bischoff, F.; Long, M. L., and Hill, E.: Acid-Base Equilibrium in Hyperthermia Induced by Short Radio Waves, J. Biol. Chem. **90**:321 (Jan.) 1931.

5. ————————; Ullmann, H. J.; Hill, E., and Long, M. L.: Studies in Hyperthermia Induced by the High Frequency Electric Current, J. Biol. Chem. **85**:675 (Jan.) 1930.

6. Danielson, W. H., and Stecher, R. M.: Acid-Base Balance in Blood in Hyperthermia, Proc. Soc. Exp. Biol. & Med. **32**:1015 (April) 1935.

7. Enders, J. F., and Shaffer, M. E.: Studies on Natural Immunity to Pneumococcus Type III, J. Exp. Med. **64**:7 (July) 1936.

8. Landis, E. M.; Long, W. H.; Dunn, J. W.; Jackson, C. L., and Meyer, W.: Studies on Effects of Baths on Man, Am. J. Physiol. **76**:35 (March) 1926.

ELECTROSURGERY IN ADVANCED CANCER AND RECONSTRUCTION *

TIBOR DE CHOLNOKY, M.D., F.A.C.S.

NEW YORK

As has been the case with every new instrument, pharmaceutical, or mode of treatment, electrosurgery has suffered from uncritical enthusiasm and unwarranted conclusions. The dogma was evolved that electrosurgery is the method of choice in treating cancer and that it should replace the scalpel because it seals the capillaries and prevents the dissemination of cancer cells.

To investigate this problem I began experiments in this field ten years ago. On the basis of such clinical experience the conclusion has been reached that electrosurgery seems to have a definite place in the treatment of malignancies, as was indicated in previous papers.[1, 2]

The early enthusiasm which was based on the manifold theoretic advantages was dampened, and in the field of oncology the surgical use of the high frequency currents was curtailed to the treatment of precancerous lesions, and exceptionally early cancers of the skin and mucosa, as well as suitable forms of recurrent and advanced cancer.

In the Skin and Cancer Unit of the New York Post-Graduate Hospital all primary operable malignant tumors are treated by surgery except those for which radiation has proved of superior value. During major operations electrohemostasis with proper precaution and limitation is currently used as a time and material saving method. This paper is presented to report personal experiences and to encourage more extensive use of electrosurgical methods in selected cases of advanced cancer.

Indications and Technic of Electrosurgery

Cancerous growths in the borderline and far advanced cases can seldom be eradicated and all that is hoped for is palliation. Permanent or temporary improvement of local and general processes in localized tumors may be obtained by electrosurgery in advanced, ulcerated cancer. Even in the presence of demonstrable distant metastasis after the removal of the foul infected lesions patients may be temporarily rehabilitated. Therefore, electrosurgical methods are indicated in those selected cases of advanced cancer where the removal of an extensive, usually ulcerated tumor may improve the local and general condition in spite of the fact that scalpel surgery and radiation fails.

Whenever possible the cancerous lesion is circumscribed in the healthy tissues with a heavy coagulating cutting current in order to sever the superficial circulation and to allow shrinkage of the tissues to be coagulated according to the Keysser technic.[3]

For coagulation purposes one may use flat, disc, roller or bipolar electrodes. The size and shape of the different electrodes vary according to the depth and extent of the lesions. From a practical viewpoint one may say that with a sufficiently powerful apparatus the depth of coagulation obtained is approximately equal to the width of the electrode. With proper technic, the tissues are not carbonized but coagulated (cooked), exhibiting a homogeneous texture. This can be removed bloodlessly by a curette or preferably by an electric cutting loop.

* From the Skin and Cancer Unit of the New York Post-Graduate Medical School and Hospital, Columbia University; Attending Surgeon, Dr. Carl Eggers.

* Read by Invitation before a Teaching Clinic of the New England Medical Center, Boston Dispensary, Boston, January 27, 1939.

Such piecemeal removal of the coagulated tumor tissues is entirely different from the principle of scalpel surgery by which the tumor is excised in a block in the healthy tissues. The principle of electrosurgery is to follow the tumor, eradicate it if possible, and then to remove a margin of "healthy" tissue to prevent recurrence. Such pursuit of tumor tissue is facilitated by the fact that the experienced eye readily differentiates the coagulated tumor tissues from apparently healthy tissues. This can be well demonstrated, e.g. in cancer of the tongue. The use of easily serviceable and powerful apparatus which allows speedy work is important.

Electrosurgical eradication of infected tumor-tissue may be conceived as the first stage of the operation which is immediately followed by the closure of the defect (after the patient is re-draped) by a skin flap. The removal of all coagulated tissues prevents postoperative complications. No matter how desirable it may be to perform reconstruction at the same time, it often has to be postponed for observation of possible local recurrence or of incomplete removal of the tumor. Secondary granulating surfaces are skin-grafted or in some instances (as in the mouth or rectum) the wound is left to heal spontaneously.

Extensive, ulcerating primary or recurrent tumors may be entirely eradicated. Temporary control of the tumor growth invariably follows a single or repeated intervention. The minimal loss of blood during operation renders the procedure one of comparative safety. In my experience (on 100 cases) none had shock. Therefore, we may conclude that a weakened general condition is not a contraindication for palliative electrocoagulation. Attempts to eradicate or control a tumor can be made gradually at intervals conforming to the patient's condition; meanwhile supportive treatment is given. As the wound surface is covered by a film of coagulated tissue and protected from mechanical and chemical irritation until granulation appears, operations are followed by reduced postoperative complaints.

The removal of a malodorous ulcerated tumor induces comfort and morale. It also constitutes a relatively simple surgical procedure for palliation. In my experience the postoperative mortality was 3 per cent in 100 cases. Considering poor general condition and advanced malignant disease, this is a low rate.

Postoperative complications are infections and hemorrhage. Both may be avoided with care. Antiseptic dressing (preferably boric acid powder or a solution of peroxide) will control pyocyanic infection which often complicates untreated coagulated wounds. Hemorrhage may be prevented by carefully placed ligatures during the operation.

Case Reports

CASE 1. — Admitted 11-20-29. Diagnosis: Recurrent basal cell epithelioma of scalp with bone invasion. The patient, a white male, aged 59 years, gave a history of having had a small cyst on the scalp which he injured while coming out of the cellar. It healed and did not bother him until nine or ten months previous to admission at which time it opened up, bled and discharged pus. He used some home remedies on it, and the wound had healed periodically. He finally went to a physician who treated him with an electric needle, mercurochrome, silver nitrate, salves and injections, but, as the wound did not heal, he was referred to the hospital.

Since that time (during the last three years) he had five operations and two courses of radiation. At the last admission a heaped-up carcinomatous ulcer invading the bone, and measuring about 12 by 7 cm. in diameter, was found. Over the vertex a pulsating ulceration over the exposed dura was present, 6 cm. in diameter (fig. 1). The patient was lying in bed in distress unable to move his left arm and leg. Besides moderate anemia, no other important process was noted. Hemiplegia at the left arm and leg improved after admission, permitting the electrosurgical operation for palliation which was performed under colonic anesthesia on June 8, 1933.

Fig. 1. — Recurrent basal cell carcinoma of scalp with invasion of the skull.

The tumor was circumscribed, coagulated and removed. Invasion of the scalp and the bone throughout the right frontal, parietal and temporal regions necessitated the removal of about one inch of the scalp around the tumor and underlying the uninvaded bones. At the base of the tumor mass the bone had been eroded and the dura exposed for an area about 3 by 5 cm. in diameter. After the cancerous tissues were coagulated it was curetted out. The exposed dura was superficially desiccated throughout, care being taken not to cause hemorrhage or perforation. In the hope that the last days of the patient might become more comfortable, an attempt was made to close the defect by an occipital scalp flap. The bone and skin edges damaged by the high frequency current were trimmed, and the defect was covered with a scalp flap from the occipital region (fig. 2). A drain was inserted under the flap. A skin graft from the thigh was applied to the denuded occipital surface. The patient left the operating room in a critical condition.

The temperature following the operation was irregular with peaks of 105 F.; pulse 150-160, for two days, then dropped to 99 F. and pulse 80-90 for five days, after which the temperature ranged between 103 and 99 F. and pulse 80-110 for the four weeks of his stay in the hospital. After gradual improvement of the local and general conditions he was discharged (7-6-33), with the wound healed, to the follow-up clinic.

After the operation there was comparative comfort for six months. Although able to walk the patient complained of occasional pains in the head and had not much vitality. After 7 months the wound began to discharge and recurrence was noted at the left side. There was no odor to the wound. The patient died February 2, 1934, nearly eight months after the last intervention, having lost consciousness for about ten days before he died. No postmortem examination was obtained.

This patient who had developed, after a probably inadequate first intervention (electric needle), an advanced lesion diffusely involving the skull, temporarily benefited by the electrosurgical removal of a foul infected carcinoma followed by immediate plastic reconstruction. The operative procedure most probably prolonged his life and made his disease more bearable to him as well as to his family.

Case 2. — Squamous cell carcinoma (grade 1) with inguinal lymph node involvement. The patient, a 51-year-old white male, stated that three years before he had had a cyst on the left thigh which was excised but reappeared one year later. In fourteen months a second operation, followed by a series of x-ray treatments, had been performed elsewhere before he was seen by us for a second recurrence. The patient was referred to the tumor clinic with a diagnosis of angiosarcoma. Biopsy taken in the clinic was reported by Dr. D. S. D. Jessup, pathologist, as squamous carcinoma, grade 1, of the thigh.

Fig. 2. — Immediate plastic repair following coagulation and eradication of tumor. Wound healed.

Physical examination revealed on the lateral aspect of the left thigh, at the margin of the scar of the previous operations, a heaped-up, ulcerated tumor mass of rather foul odor, measuring 5 by 8 cm. in diameter (fig. 3). The tumor was fixed to the underlying tissues and diffusely infiltrated the subcutaneous tissues around the ulceration for about 1 to 2 cm. Firm palpable nodes were present in the left inguinal region. No other pathologic process was noted.

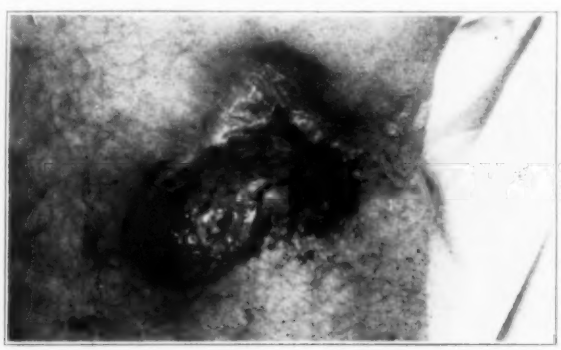


Fig. 3. — Recurrent carcinoma of the thigh with inguinal lymphnode involvement.

Electrosurgery was advised on account of the recurrent and infected lesion. Under spinal analgesia the tumor was coagulated with a roller and removed piecemeal with a loop electrode. The carcinoma appeared to be rather superficial and did not involve the underlying fascia lata and muscle. As a safety margin, after coagulation, the fascia was removed and the wound was superficially desiccated and was left open, covered with boric acid ointment dressing. Throughout the operation the bleeding was controlled with the current.

Routine inguinal node dissection was performed by Dr. Albert S. Morrow. At the operation the enlarged inguinal lymph nodes suggested carcinomatous involvement, which was confirmed by pathologic examination. Recovery was uneventful. There was some drainage from the inguinal wound but it finally healed by secondary granulation. Two weeks

later the wound on the thigh, presenting healthy granulations (fig. 4), was subjected to a Thiersch graft. The patient left the hospital 26 days after admission.

Fig. 4. — Healing after inguinal lymphnode dissection. Lymphnodes were involved.

Follow-up examination revealed no recurrence and the patient has been well for over six years (fig. 5).

Fig. 5. — No recurrence after 6 years over the skin grafted area.

Comment

This case is presented to illustrate the electrosurgical procedure in a recurrent, infected carcinoma followed by secondary skin graft. Though scalpel surgery might have given us a similar result, in this case surgical application of the high frequency currents might be preferred.

It should be emphasized that in case of squamous cell carcinoma and melanoma a routine regional lymph node dissection improves the end results.

It may be said that local excision of such malignant tumor followed by roentgen therapy to the regional lymph nodes might not have sufficed to control the metastatic growths as it was found in other cases.

In all, 100 advanced cancer cases were operated upon by electrosurgical methods. All were followed up. There were no instances of serious postoperative hemorrhage, which fact may be attributed to carefully placed ligatures to control arterial bleeding. All were major operations. There was a 3 per cent operative mortality, including patients dying in the hospital from advanced malignant disease. Death could not be charged to the electrosurgical operations proper.

Arrests for from three months to three years were obtained in the most advanced group. Three-year to five-year arrests were obtained in the less advanced group, with 8 per cent apparent five-year "cures."

The intervention did not seem to shorten the estimated life period in any of the cases. All but a few of the patients were, at least temporarily, benefited both mentally and physically. Many patients were rehabilitated[1] and able to return to their homes with the external manifestations of cancer eliminated, and this apparent freedom from disease often lasted until internal general metastases caused death.

Summary and Conclusion

1. More extensive use of electrosurgery in the form of coagulation is recommended in the ulcerated, recurrent advanced cancer where scalpel surgery and radiation fails.

2. Indications and technic are outlined.

3. Results with an operative mortality of 3 per cent in 100 cases are: palliation in the most advanced group from three months to three years. Three to five years arrest in the less advanced group with some five year "cures" (8 per cent). Immediate plastic reconstruction, if feasible, shortens hospitalization and improves ultimate results.

4. Two illustrated cases one from the far advanced and one from the least advanced group are presented.

5. Electrosurgery has proved a valuable addition to the control of advanced cancer. Good palliative results have been obtained, and these have lasted for periods of three months to over five years, depending on internal involvement. The hospital stay of these patients was shortened, and good results have been obtained in 26 per cent by immediate plastic reconstruction with the local control of the disease until death in the majority of the cases.

References

1. de Cholnoky, T.: Electrosurgery in Advanced Carcinoma, Ann. Surg. **103**:415 (March) 1936.

2. ————: High Frequency Currents from the Surgical Point of View, Med. Record **149**:405, 1939.

3. Keysser, F.: Electrochirurgie, Berlin, Fischer's med. Buch., 1931.

Discussions

Dr. Channing C. Simmons (Boston): I have little to add to what Dr. Cholnoky has already stated, for my experience has not been as great as his. I will add, however, that I am very glad that he does not make extravagant claims for the method. I have read papers and bulletins published by other individuals who apparently believe that electrosurgery is the only method of treatment of cancer. Dr. Bovie developed the first machine of this character in which there was an accurate control of the coagulation and cutting current. Experimentally on the machine, however, the depth of coagulation was found to depend on the size of the electrodes and also upon the tissue. The current was deflected by the fascial planes and also bore some relation to the blood supply. Much of the early work on electrocoagulation

NOTE: The reader interested in more detailed description of the technic and results is referred to the author's book now in preparation, "Rehabilitation in Advanced Cancer."

was carried on in Sweden and I was much impressed by the work at the Radiumhemmet with two large active electrodes. Dr. Cholnoky spoke of this form of treatment.

Electrosurgery is important in the treatment of superficial growths such as large carcinomas of the scalp, but is particularly valuable in the treatment of cancer in and about the mouth. We have employed ether anesthesia for operations about the mouth using special technic to minimize the danger of explosions and to date, in a relatively large series of cases, have had no trouble. Following extensive operations on the tongue, however, secondary hemorrhage has occurred in about 25 per cent of the cases. The hemorrhage is often severe but we have had no deaths. It cannot be controlled by stitches taken about the coagulated area at the time of operation.

I wish to compliment Dr. Cholnoky on the photographs he has shown and also on the selection and number of instruments which are apparently adaptable for use in every type of tumor. I have had no experience in treatment of relatively deeply situated growths by this method but should feel there might be danger of injury of vital structures such as the large vessels in the neck, or if employed in the pelvis, to the ureters or large vessels.

Dr. Leland S. McKittrick (Boston): It is very difficult to discuss Dr. Cholnoky's paper because he has done such a splendid and complete job and because — and I am speaking personally now, not for anybody else — at least in my own experience electrosurgery has fallen far short of the excellence to which Dr. Cholnoky has carried it. He has well shown what a man, interested in developing a method, can accomplish when he applies himself; starting from the beginning, thoroughly acquainting himself with the instruments he is dealing with, what they will do, then applying this knowledge to his clinical cases.

One cannot but be impressed with the careful selection and discussion of cases. He does not say that the only way to treat cancer is by electrosurgery, but the cases which he has shown certainly show the excellence with which he has selected them and carried out the treatment. The results he has obtained are very striking. We know that he has a very good idea just how deeply his electrodes are coagulating. This bespeaks the confidence of experience and in the apparatus he works with. The safe and successful use of any therapeutic agent — whether it be x-ray, radium, or electrosurgery — which acts beyond the point of application requires a great deal of experience.

One word about rectal cases. Dr. Cholnoky is perfectly right, but I hope that his enthusiasm for electrosurgery in cancer of the rectum does not carry him too far. I was pleased that he mentioned papillomatous lesions in the discussion for it is this type of lesion where electrosurgery is useful. I have not said anything about them, but we have at Palmer a few — not too many, because I do not think there should be many —patients with papillomatous cancer of the rectum, patients all elderly or poor surgical risks, who after painstaking and careful electrocoagulation followed by radium implantation have, as suggested, been spared a colostomy and have lived for varying periods of time with surprising comfort. We now have several of these patients free from any evidence of disease after periods of six months to three years. I hope no one carries away the impression that a local procedure of this or any character is to be used except in very selected cases.

Dr. Ernest Daland (Boston): I have been interested in electrocoagulation since the day when Dr. Bovie developed his machine and I have treated a good many cases. Since that time, x-radiation has come to be used more and more instead of electrocoagulation, but there are still many cases where this can be applied, particularly in those that have not responded to x-radiation.

I think that we cannot impress one too much with the fact that these individuals are very free from pain after this very extensive procedure. Many physicians who see them being operated on think that they are going to have a great amount of pain. I always invite them to come and see the patient the next day.

It is interesting to see that Dr. Cholnoky had nine cases that have survived five years. I think that the important thing to remember about this is that one cannot tell positively which case is going to be palliated and which cured. I should like to show some slides of some cases treated for palliation, but in which a cure was obtained. I have not had any experience with as large electrodes such as Dr. Cholnoky has used; that is something very definite for us to try in the future.

SIGNIFICANCE OF FUNCTION IN TENDON REPAIR *

MICHAEL L. MASON, M.D., F.A.C.S.

CHICAGO

The problem of tendon healing and the various factors which affect it are still far from settled. There is no real agreement on the actual nature of the process, whether union occurs by scar tissue formation or by the activity of specific tissue. Those who believe the tissues are simply a cicatrix, assume that the requirements of this particular scar determine its development into tissue equivalent to true tendon. Those who believe the process is specific assume either that the union results from the activity of specific connective tissue cells or that the tendon itself takes part in the process. Whatever may be the opinions concerning the specificity or non-specificity of the process, the broad outlines of tendon healing seem to be pretty well agreed upon. From a histologic standpoint, tendon healing occurs in two stages. There is first the stage corresponding to the initial healing of any tissue whereby, as the result of fibroplasia, a connective tissue scar is formed. This stage reaches its climax in about two weeks and many tissues reach normal tensile strength at this time. The second stage of healing is specific in nature in that the connective tissue scar originally formed is reorganized into specific tissue, or at least into tissue to all intents and purposes indistinguishable from specific tissue. During this stage of healing, tissues such as bone, fascia, and tendon regain their normal tensile strength. Recent work by Howes, Harvey, and Hewitt[1] has shown that this stage begins at about the third week of repair and continues for many months.

There is no need at this time to discuss the problem of wound healing in general. From the practical surgical standpoint it is realized that the operative repair of tendons requires the most careful non-traumatic technic, and I have elsewhere[2] gone into this in some detail. There is one aspect of tendon surgery, however, upon which there seems to be no agreement, and that is the problem as to when and how to initiate passive and active motion following tendon suture. This problem it seems to me can only be answered by a study of the behavior of sutured tendons in relation to varying degrees of motion. These studies should take into consideration not only the histologic changes which take place, but the tensile strength, the reaction in the surrounding tissues, and the gliding power of the resultant healed tendon.

Factors in Tendon Healing

Of the many factors which affect tendon healing, the one which has received the greatest amount of attention has been that of function. We owe to Roux the concept of the functional adaptation of tissues, and to Wolff the introduction of this concept into clinical surgery. A great amount of experimental work has been carried on in an attempt to determine the significance of function in tendon repair. As the outcome of this it has come to be generally admitted that function has a definite effect upon healing tendon but that this effect is of particular significance during the stage of maturation or differentiation. Studies so far have dealt largely with the gross and microscopic appearance of healing tendons and tendon and fascial grafts, but data applicable to clinical surgery are not available.

* From the Department of Surgery, Northwestern University Medical School and Passavant Memorial Hospital.

* Read at the Nineteenth Annual Session of the American Congress of Physical Therapy, Cleveland, Ohio, September 5, 1940.

Recently reported work by Harvey Allen and myself[3] dealt with the problem of tendon repair from the standpoint of return in tensile strength. Observations have been made on the rate of increase in tensile strength following suture, on the effect of function upon this rate, on the effect of function upon the healing reaction, on the tissue-holding powers for the sutures, and on the gliding powers of the healed tendon.

The observations which we have made and the deductions drawn from them can only be considered as tentative since there are so many factors which enter into the problem. It is difficult to standardize the dog; the rates of healing vary from animal to animal[4] and the factors are difficult to control. I feel, however, that our studies indicate that function plays a quite significant rôle in repair, that the surgeon and the physical therapeutist may use function to great advantage, and that by some such method as we have employed an answer may be obtained to the question as to how and when to allow use following tendon suture.

In a number of dogs the flexor carpi ulnaris tendon was exposed, its sheath divided, and the tendon separated from its mesotenon. The tendon was then cut across transversely and immediately sutured. Sutures were made to pull transversely to the tendon fibers.[5] The tendon sheath was not closed but left open, the subcutaneous tissues and the skin were closed separately, and the leg placed in a plaster cast, holding the elbow and wrist in flexion. In a small group of animals this cast contained an aluminum splint to which the foot was securely bound. In the other dogs the foot was enclosed completely in plaster. In those animals provided with a splint the foot was freed at the end of a week and the animal allowed to actively flex it; extension, however, beyond the point of original fixation was prevented by the splint. This is the group with restricted use, to be referred to later. Of animals with a complete cast, some were kept continuously immobilized for three weeks and allowed active unrestricted use thereafter, while others were kept completely immobilized for five weeks. Some animals succeeded in removing their casts completely or partially before the allotted time, and these dogs had unrestricted active use quite early after repair.

The operated tendons were removed at various intervals following suture, the amount and nature of the reaction noted, the amount of separation between the stumps measured, and the tensile strength of the union determined in a spring balance apparatus in which the tension could be gradually increased. Tensile strength of the specimens was computed in grams per square millimeter at the site of rupture.

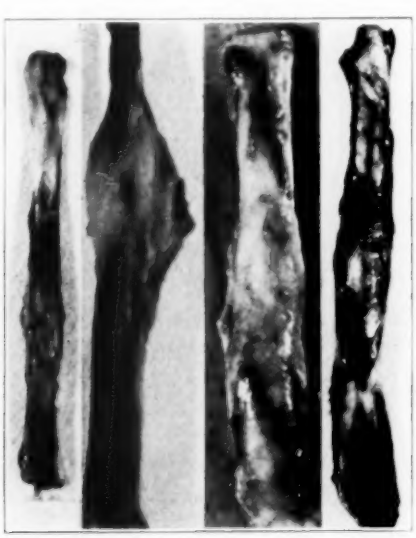
The curve of return in tensile strength of the continuously immobilized tendons follows the course one would anticipate from the observations of Howes, Harvey, and Hewitt[1] up to the twenty-first day. There is the anticipated drop in strength following suture, the rise in tensile strength starting on the fourth or fifth day, and the rapid rise until the sixteenth day. Here the curve tends to flatten and start to rise again about the nineteenth day. Following the twenty-first day the continuously immobilized tendons show very slight tendency to continue this rise, and on the thirty-fifth day have practically the same tensile strength that was found in twenty-one day specimens. In the case of those animals which were immobilized for three weeks and then allowed unrestricted active use, the tensile strength curve continues to rise after the twenty-first day and is significantly higher at the end of thirty-five days than the immobilized tendons. When the animals succeeded in removing their casts and started active and unrestricted use of the sutured tendon, a number of factors must be considered. We must take into account the time at which the cast was removed, the degree of activity of the dog,

the reaction excited about the area of operation, as well as the tensile strength of the union. In those dogs with early unrestricted use, tensile strength values after the sixteenth day tended to be well above those for immobilized tendons. Similarly, tendons with restricted use, while not quite consistent, tend also to exhibit rather high tensile strengths. In this group, it is of interest that at fourteen days the completely immobilized tendons and the tendons with restricted use have the same tensile strength. It is not until after the fourteenth to the sixteenth day that high values of tensile strength are obtained. Despite the inconstancy of the findings, the fact remains that the only tendons which attained high levels of tensile strength during the five-week period of observation were those in which a functional stimulus was present. This is the acceleration of the curve of increase in tensile strength.

We cannot take the tensile strength as the only gauge of the effect of function upon tendon repair. The data so far obtained justify the conclusion that function leads to an acceleration of return in tensile strength. However, this effect is not evidenced until the healing reaches the stage of maturation or organizing differentiation. During the fibroblastic stage function appears to have little or no effect on the tensile strength.

Effect of Motion

We know, however, that motion and use tend to disturb healing, and while we should certainly institute function in such a way and at such a time as to stimulate a strong union as quickly as possible, we should do it so as to excite a minimum of reaction. The tendon which is continuously immobilized in a cast heals with a minimum of reaction (fig. 1 A). If a tendon is



A B C D

Fig. 1. — A. Completely immobilized tendon six weeks after suture; the ends are not separated, the sheath tissues are only slightly thickened and permit unimpeded gliding. B. Tendon completely immobilized for three weeks and allowed unrestricted use for two weeks; site of union markedly bulbous. C. Tendon immobilized for 7 days and used without restriction for 9 days; the stumps are bulbous and have separated 7 millimeters. D. Tendon completely immobilized for 3 weeks, allowed restricted use for 2 weeks; very slight thickening, tendon glides, and there is no separation.

subjected to active and unrestricted use even after three weeks of continuous immobilization there is always a bulbous reaction at the site of union (fig. 1 B). If active and unrestricted use is started in less than two weeks after suture, there is marked increase in the reaction and there is always more or less separation of the stumps at the line of union (fig. 1 C). In fact, the reaction is often greater in the tendons with unrestricted use than is indicated in the figure. In those tendons which are allowed restricted active use, however, as is shown in figure 1 D, the reaction, while slightly greater than in tendons completely at rest, is not marked; the separation is minimal, and the tensile strength appears to mount very rapidly. Our experiments indicate that after tendon repair, restricted use may be safely started toward the end of the period of fibroplasia; i.e., about the twelfth to the fourteenth day. Earlier use leads to an increase in reaction and a separation of the tendon ends, and does not increase the tensile strength of the union.

The holding power of the tissues for the sutures is also of significance here, and has a direct bearing on the problem of the time to start motion.

We often lose sight of the fact that during the early stages of repair the tissues tend to soften as a part of the process of healing. The hold which the tendon has for sutures must therefore diminish for several days after operation. If, to this natural softening which occurs, there is added necrosis of tissue subsequent to tension, the holding power is further diminished and it would seem that function which would cause such necrosis should not be started until the holding power had returned. We have made certain observations on the holding power of the tendon for silk sutures, and we have found that at the time of closure an average pull of 2.8 pounds is required to cause an initial slight separation of the tendon ends. Complete rupture of the union, however, does not take place until an average pull of 5.23 pounds is reached, at which pull the sutures break. Starting immediately after repair, however, the curves for both the tissue holding power and the tensile strength drop precipitously. The tensile strength is already rising by the fifth day and rises above the level at which initial separation occurs immediately after suture by the ninth postoperative day. The holding power of the tendon for the sutures, however, does not begin to rise until after the fifth day and does not stay consistently above its initial level of 5.23 pounds (plus) until the fourteenth day. During the first ten to fourteen days after repair the stumps have relatively little holding power for the stitches, and separation occurs by their pulling out. Following the fourteenth day the holding power increases, and separation occurs with breaking of the line of union and of the sutures.

There is an occasional pull-out of the threads after the fourteenth day, and an occasional breaking before the fourteenth day, but the variations are of no clinical significance. These data indicate that we cannot rely upon the line of union possessing the strength immediately afforded by suture, but that we must reckon with a significant drop in this strength. It would seem unwise to initiate function during the time both strengths are dropping, and quite hazardous to allow pull of any magnitude before the tendon has regained its original holding power for the sutures. It is difficult to evaluate their loss in tensile strength which Meads and Ochsner[6] have so well demonstrated. Since the tendon holding power for the suture drops so rapidly and to such a low level, it does not seem to me that loss in the tensile strength of the silk is of great significance.

The amount of separation which is found to have taken place during healing, and before the test for tensile strength is made, also gives us some idea as to the effect of function on the union. In those tendons which have

been completely immobilized the separation is very slight, and averaged but 1.07 mm. Where unrestricted active motion has been instituted at the end of three weeks of complete rest, the average separation is 4.44 mm. If active unrestricted use is started earlier, the amount of separation is still greater, and averaged 5.85 mm. However, in those animals allowed restricted use, the average separation of 0.85 mm. is even lower than for animals kept completely immobilized. The results seem to show that the intervening tissue between the stump ends is stronger and more resistant to stretching at the end of three weeks when allowed restricted use than if the tendons had been kept completely immobile for a similar period of time. This is simply a measure of the effect of function upon the tensile strength of the healing tissues.

There would seem to be no indication to start physical therapy until after the second week following tendon repair. At this time heat and mild massage will be of value in bringing more blood to the part and in mobilizing the small joints which have been held quiet in the splint. It is essential, however, that during treatments the part be kept in the relaxed position in which it has been held, so as to avoid undue stress on the tendon callus. Restricted active use within the limit permitted by the splint may be allowed after the fourteenth day. At first the patient may put the part through the permitted range of motion two or three times a day. After the fourth week more use should be encouraged, but always the part should be protected by the splint which prevents the antagonistic muscles from exerting a pull on the site of repair. From time to time the splint may be adjusted so as to allow greater freedom of motion until, at the end of five or six weeks, the splint is entirely discarded. Full use may then be permitted and the patient instructed to soak the hand daily, at home, for from twenty to thirty minutes in warm soapy water, and to exercise it in the bath. From this time on much of the physical therapeutist's effort may be directed toward establishing free range of motion by passive as well as active exercises and gentle stretching maneuvers following the application of heat.

Discussion

From the standpoint of tendon surgery, it would seem that the surgeon and the physical therapeutist have in function a valuable aid, providing it can be used wisely. The problem seems to be that of choosing the time at which to allow use of the sutured tendon, and determining how much use to permit. I cannot agree with those who initiate active use immediately after repair, since it seems to me that this defeats the purpose for which it is intended. The healing tendon requires rest. Motion allowed too early leads to increased reaction and the production of the adhesions which it was instituted to prevent. In view of the softening which takes place in the ends of the tendon, it would seem illogical to subject them to the pull of sutures until such a time as they have become firm and have regained their holding power. This occurs at about the end of the second week after suture. The effect of function upon the curve of tensile strength is not manifest until the termination of the period of fibroplasia and the onset of organizing differentiation. This period also comes toward the end of the second, or the beginning of the third week. As to the type of function, it would seem fairly evident that this should be restricted at the start and increased gradually until full use is permitted. The degree of use first allowed and the rate at which it should be increased cannot be stated dogmatically. Individuals differ in healing powers and tendons appear to differ in the rate at which they regain their tensile strength. Some experimental work now being done seems

to show that after about six weeks most tendons will have healed sufficiently strong to allow free use. While it is not possible to lay down any rigid rules, my own feeling is that restricted use may be started safely at about the end of the second week after repair. This may be gradually increased during the next three to four weeks when full use may be permitted. This period of time corresponds quite well with experimental observation made by Stewart.[7]

Summary

Tendon healing as measured by its tensile strength exhibits three phases: first, a phase of rapid diminuation in strength; second, a phase of increase in strength up to about the sixteenth day; and third, a second phase of increase in tensile strength which starts about the nineteenth day and continues for an undetermined period of time.

The function to which the healing tendon is subjected is directly reflected by an acceleration of the third phase of the tensile strength curve. During the first and second phases function has no effect unless it leads to enough separation of the tendon ends to slow up the curve.

Function during the first and second phases leads to increased reaction and separation. Restricted use started on about the fourteenth day leads to but slight increase in reaction. Active, unguarded use even after three weeks' immobilization causes a marked reaction and increased stretching of the line of union.

The holding power of tendon for the suture shows a marked drop below its original power and does not begin to rise until the fifth day after closure. It does not rise consistently above the strength of the suture until the fourteenth day. Although the strength of union for the first nine days is entirely due to suture, it is not as great as the immediate sutured strength until after fourteen days. The importance of adequate relaxation during this time is evident.

References

1. Howes, E. L.; Harvey, S. C.; and Hewitt, C.: Rate of Fibroplasia and Differentiation in Healing of Cutaneous Wounds in Different Species of Animals, Arch. Surg. **38**:934 (May) 1939.

2. Mason, M. L.: Wound Healing, Surg., Gynec. & Obst. **69**:303 (Aug.) 1939.

3. ———— and Allen, H. S.: The Rate of Healing Tendons: An Experimental Study, Transactions of the American Surgical Association **58**:509, 1940.

4. ———— and Shearon, C. A.: Process of Tendon Repair; Experimental Study of Tendon Suture and Tendon Graft, Arch. Surg. **25**:615 (Oct.) 1932.

5. ————: Primary and Secondary Tendon Suture: Discussion of the Significance of Technic in Tendon Surgery, Surg., Gynec. & Obst. **70**:392 (Oct.) 1940.

6. Meade, W. H., and Ochsner, A.: The Relative Value of Catgut, Silk, Linen, and Cotton as Suture Materials, Surgery **7**:485 (Apr.) 1940.

7. Stewart, D.: Experimental Study of Return of Function After Tendon Section, Brit. J. Surg. **24**:388 (Oct.) 1936.

Discussions

Dr. Arthur C. J. Brickel (Cleveland): We have been favored with the account of a series of experiments aiming to disclose what effect function plays in the healing of tendon sutures. Does use of the tendon favor or disturb final healing? Dr. Mason has designed a series of investigations which lead us to believe that there is a period at which motion may be permitted with favorable reaction and that there is also a period when motion has an undesirable effect. There is an optimal time for beginning function, and all wish that this time were clearly apparent. In this respect opinion varies. Some surgeons begin passive motion within two days. However, they limit the range of motion by a splint and always make the movement towards the suture line, mainly to prevent adhesions. Others restrict motion entirely for two weeks and then begin passive not active movement. Personally I have felt without knowing exactly why that early passive motion is beneficial and that active motion is best deferred for two weeks.

From the essayist's report we all now have a better understanding of the forces

at work during tendon healing and we should get better results by keeping in mind the changes he has pointed out; namely, the early softening and loss of tensile strength, and the definite acceleration of tensile strength which function promotes after the second week.

Unfortunately we cannot control, as in experiment, the conditions surrounding clinical tendon injuries, which are often complicated by dirt, ragged tearing, disruption of blood supply. In addition, human beings differ in their healing powers and difficult tendons present special problems. The entire question of tendon healing and treatment is complicated. Mason has thrown new light on the problem and has made progress of great importance to assist others who are working on the same subject. We wish to warmly praise Dr. Mason for his excellent report and thank him.

Dr. James A. Dickson (Cleveland): I want to congratulate Dr. Mason on the presentation of his experimental work on tendon repair and its clinical application, and I feel when his paper is published it will warrant much study by all of us. It contains too many truths and principles to be grasped at one reading. His work establishes experimentally many of the principles of tendon repair that have been advocated from clinical experiences by some, but have been totally ignored by others. I can well remember the excellent clinics given twenty years ago by my old chief and teacher, Sir Robert Jones, on tendon surgery. His conclusions were drawn from a very extensive clinical application and accurate observation, and it is interesting to note that his conclusions were almost identical to those arrived at by the experimental work that has been presented. I can remember his emphasizing the point that an adequate period of rest must be given a tendon before motion is started. He insisted on the tendon being kept in a position of relaxation after suture for from two to three weeks. Then guarded voluntary exercises were instituted, and as the clinical picture warranted, these exercises were gradually increased until full function was established, which was usually between the fifth and the sixth week. I have continued to use these principles in my own practice and I have never been able to satisfy myself that the advocates of early motion after suture were making use of a correct principle. It always seemed to me that nature should be given an adequate time to produce a certain degree of repair before the strain was thrown on the sutured ends. Adequate protection with increasing function was always considered an important part of the treatment.

Sir Robert always insisted that the functional end result did not depend on the type of suture that was used but rather on the accuracy of the surgical repair and on the application of good principles in the after treatment. Silk was always used for the suture material, not because of its tensile strength, but because a much neater surgical repair could be accomplished than by most other types of suture available.

I feel that Dr. Mason's work establishes once and for all that active use immediately after repair should be abandoned and it also establishes the advantages of continued protection and the gradual increase of voluntary exercise. Dr. Mason has brought us a very important message and his paper should be very seriously considered by all orthopedic and traumatic surgeons and physical therapeutists alike, as I am confident that a full understanding of the significance of his work will help us to establish very definite principles in the after treatment of tendon repair. I am sure that our end results will be in proportion to our observance of those established principles.

PHYSICAL THERAPY IN DISABILITIES COVERED BY WORKMEN'S COMPENSATION *

HENRY H. JORDAN, M.D.

NEW YORK

The introduction of the workmen's compensation law places a great and partly new responsibility on the medical profession and opens a wide field for the physician, who is willing to participate in the treatment of injuries arising "out of and in the course of employment." Physical therapy has its definite place in the management of such disabilities. With regard to the basic principles of the workmen's compensation law one must keep in mind that its application should serve the best interest of the injured worker and at the same time should be fair to society. As far as the physician is concerned, compensation work should be neither an occasion for charity nor for business. Experience based on 15 years of compensation work and on a personal review of more than 30,000 cases shows that the physician can and should strive for a better solution of the problems presented by the workmen's compensation law.

Physical therapy, whenever indicated, should be started as soon as possible following injury, and should be applied and continued until the best possible restoration is accomplished. It should not be undertaken, however, before the correct diagnosis is established (medical viewpoint) and before the compensability of the case is recognized (legal viewpoint).

Early diagnosis of the type of injury is a prerequisite for effective treatment and thus of great importance for complete and speedy rehabilitation of the injured worker. In the majority of cases the diagnosis cannot be established without roentgenography. This should immediately follow the clinical examination and not vice versa. The roentgenologist should have the clinical data in order to make sure that the proper region is x-rayed. Unexpected positive x-ray findings are more frequent than a negative result. There is still an unfortunate tendency to postpone the x-ray study until swelling and hematoma have disappeared. This may cause complications which could be avoided. Incomplete fractures of metatarsal bones, for instance, may become complete and the fragments displaced if they are not recognized and therefore not immobilized and supported. Moreover, without adequate treatment based on the x-ray findings, such incomplete fractures remain painful and may lead to Sudeck's atrophy.

Diagnostic Safeguards

Some of the common errors which came to my attention are:

1. Compression fractures of one of the vertebral bodies from dorsal 10 to lumbar 1 are not infrequently overlooked if the x-ray examination is limited to the lumbosacral region at which level the patient may localize his pain.

2. Fracture-dislocation of the head of the humerus at the shoulder joint is another pitfall. Either the dislocation of the head, or the fracture of the neck of the humerus is not diagnosed. The prognosis of this serious injury is never good, and definitely worse if one or the other component is overlooked and time lost.

* Read at the Nineteenth Annual Session of the American Congress of Physical Therapy, Cleveland, Ohio, September 6, 1940.

3. At the wrist a fracture of the scaphoid, as a rule without displacement of the fragments, is sometimes not visualized. Occasionally a bipartite scaphoid is mistaken for a fracture. More surprising is the experience that the severe trauma of a perilunar dislocation of the wrist may escape recognition.

4. In fractures of the internal malleolus at the ankle a simultaneous fracture of the fibula below the knee sometimes escapes recognition.

5. In one case a fracture of the os calcis was overlooked when attention was focused on a fracture of the tibia in the same leg.

Routine x-ray technic is frequently not sufficient to recognize certain bone injuries. They require special types of exposures, for instance, tangential view of the patella, axillary view of the shoulder joint, transthoracic exposure of the humerus, oblique view of the clavicle, special position of the wrist for the recognition of fractures of the scaphoid, "tunnel view" of the knee joint.

If the history of the accident and clinical examination do not exclude bone injury, x-rays must be taken at once, regardless of the extent and nature of soft tissue damage. They must be taken in two planes or as stereos on films large enough not to overlook remote bone injuries. Both extremities should be x-rayed for comparison in order to recognize anomalies as such. X-rays frequently help to discriminate from the very beginning between traumatic and non-traumatic lesions. This is important in the so-called "industrial back." A roentgenographic record of osteoarthritic changes present at the time of the alleged injury or within a few days thereafter constitutes the only fair and scientific criterion of preexisting disease and the possible influence of an injury on its further course.

Once the diagnosis is established, efficient treatment should be given immediately, with a definite plan for quick rehabilitation. At this point, however, the responsible physician should consider an important question peculiar to "disabilities covered by workmen's compensation." Assuming that subjective complaints and objective findings are in accord, the problem remains as to the causal relation between the pathologic condition present and the injury sustained. Eliminating from this discussion the part of the employer, insurance carrier and legal authorities in examining the compensability of a reported case, we must analyze the predominant role of the first attending physician. This in my experience is a crucial point not yet sufficiently recognized and discussed, and therefore the source of many errors which could be avoided, saving time for all concerned, considerable expense to society, and disappointment and a lasting grievance for the injured worker.

Importance of Early Diagnosis

The desire to explain the sudden realization of a physical disorder causing disability as the result of a concrete, simple incident is deeply rooted in human nature. If such disability is first noticed during insured employment, the expectation of compensation may contribute to establish the causal relation between disability and employment in the worker's mind. He is frequently not in a position to recognize the true nature of his ailment or injury and blames in good faith an incident while at work for the disabling result, even when a definite accident (trauma) has not occurred. By the time he reaches the physician he is able to explain his complaints with a more or less definite story of an accident. The physician, with his mind focused on the pathologic condition and its efficient treatment, as a rule accepts the patient's story without much attention to the causal relation. This is the point where his participation in workmen's compensation places

a new burden on the physician's shoulder, one which is foreign to medical practice in general. His responsibility to the patient is widened through his obligations to society; he becomes the guardian not only of the worker's health, but also of public funds which pay in the end for the unnecessary, as well as the necessary, expenses. Naturally, the physician's cooperation in workmen's compensation is, and must be, limited to the field in which he is competent; namely, to the medical problems. His task with regard to the causal relation may be discharged with two considerations.

The first one is on familiar ground. Careful differential diagnosis will decide in many instances the traumatic or non-traumatic nature of the lesion present. The physician, who sees the patient immediately or soon after the alleged accident, is often in a position to establish the exact diagnosis on the basis of the acute symptoms, while this may be quite impossible many weeks later.

The following examples illustrate this point:

A sprained ankle in a patient with pronated flat feet may lead to a rigid (spastic) foot, causing complete disability of many weeks. So may a painful flat foot without trauma. Differentiation is possible from the acute symptoms (localization of pain, swelling, hematoma), but not at a later date.

In dislocation of the shoulder joint the first attending physician can well determine whether he deals with an original traumatic dislocation or with an incidence of recurrent dislocation. Later, when the injured worker claims compensation for permanent disability due to recurrent dislocation of the shoulder, a correct first report is of greatest value.

In lower back pain, a main problem of workmen's compensation, differential diagnosis may be so complicated that it cannot be definitely established at the time of the first examination. The experienced examiner, however, may well be able to assert or exclude a recent injury to the erector spinae muscles (traumatic lumbago), and immediate Roentgen examination will determine beyond doubt whatever changes have been present in the spine at the time of the accident.

In injuries of the foot one must differentiate between perimetatarsal osteoma and fracture, spur at the os calcis and gonococcic arthritis, also violent fungus infection.

In the region of the knee, one must separate referred and static pain due to pronated flat feet or from arthritis of the hip joint, and osteoarthritis of the knee joint from injury to the semilunar cartilage.

One must remember that tear of fibers of the adductor muscle group may cause long disability.

Study of the shoulder and arm involves periarthritis humeroscapularis, calcified bursae, rupture of biceps tendon; bursitis olecrani and epicondylitis at the elbow; stenosing tenosynovitis at the wrist.

The second consideration with regard to the causal relation requires a new line of thought.

The physician must try to gain from the patient's story a clear picture of the course of events which the injured worker holds responsible for his disability. He must decide whether the incident described could have caused the changes found on clinical and roentgenologic examination, in other words the physician must form an opinion with regard to the accident as competent producing cause. This consideration requires sufficient knowledge of working conditions as well as diagnostic imagination.

It may be worth while to stress the point that this mental process is not a deviation from medical practice, but is essential for a complete and correct diagnosis in insurance medicine. It has often definite repercussions

on the differential diagnosis; it helps to discriminate between traumatic and non-traumatic lesions. It may solve the question whether an established process of traumatic origin is solely responsible for the present disability, or whether the latter is due to some other damage caused by the accident which so far escaped recognition.

Therapy

The treatment of disabilities covered by workmen's compensation encompasses traumatic surgery, orthopaedics, physical therapy, neurology, dermatology, and the like. A great number of cases may receive competent care from the general practitioner, who may at times request the advice of a specialist. Sincere cooperation between general practitioner or an expert consultant will lead to a most gratifying result. The specialist helps to establish a difficult diagnosis to determine the advisability of hospitalization, or suggests treatment to be carried out by the general practitioner. Re-examination of the patient at regular intervals is essential. This arrangement in my experience has worked to the advantage of all concerned. The injured worker receives from the very beginning the best of care under competent supervision without losing the valuable personal contact with the physician of his own choice. The insurance carrier may be confident that rehabilitation of the injured will be as quick and complete as possible, at the same time saving expenses which accumulate if the patient is transferred to the specialist or hospital after weeks of inadequate treatment. The general practitioner may keep his patient, and may profit in his professional training from the advice and guidance by a competent specialist. The specialist, finally, is enabled to examine and follow a greater number of cases, thus widening his experience by observing the results of therapeutic methods available in general practice.

It is beyond the scope of this paper to discuss in general the treatment of disabilities covered by workmen's compensation. The type of injury and the patient's condition determine the treatment which will be essentially the same whether the case is compensable or not. There are, however, certain aspects peculiar to workmen's compensation which influence the therapeutic procedure and deserve special attention. The patient and the insurance carrier are equally interested in quick and complete rehabilitation followed by return to gainful employment. In a great number of cases the physician will be in a position to fulfill these requirements, provided the insurance carrier grants the necessary material aid without delay. A careful survey of thousands of compensation cases shows that the best available treatment, continuously applied until the desired end-result is reached, although necessarily expensive, costs less than insufficient treatment followed by high compensation. In many instances the end-result shows that "patience pays." Non-union of fractures, Sudeck's atrophy, arthrosis following joint injury are frequently caused by insufficient immobilization, premature unprotected weight bearing or too early manipulation prompted by a desire to shorten the course of treatment.

The forces helpful in restoring the body to normal, should be allowed to act uninterruptedly as long as the process of repair lasts, and anything which tends to hold up repair must be eliminated. This does not imply that massage or radiant heat or sinusoidal stimulation should be applied for twenty-four hours a day. Far from it. Injury to soft tissues, for instance, often of greater significance than a fracture, calls for the same complete rest as the latter, with careful attention to the circulation which is of prime importance during the early stage of repair. In a sprained ankle or wrist, in an injury to one of the lateral ligaments at the knee, immediate immobilization in an unpadded plaster-of-Paris cast for a week or two followed by a

short period of daily physical therapy is the method of choice. Its initial expense is greater than that of mere bed rest, crutches, sling, ice-bags, liniments, and the like, but the end-result is far superior and the period of disability infinitely shorter. The principles of modern fracture treatment, i. e., uninterrupted complete fixation in a physiologic position until healing has occurred with full active use of the rest of the body, should be applied to all injuries.

The ambulatory patient should receive physical therapy, whenever indicated, at least once a day. The common routine of two or three treatments a week is definitely inadequate. Moreover, such office treatment must be supplemented by therapeutic measures during the rest of the day according to the requirements and facilities of the individual case.

While insufficient and inadequate therapy may be worse than none, one must also remember that treatment can be overdone. Prolonged and too intensive heat treatment is dangerous when the local circulation is disturbed. Elevation of the limb, as a rule indispensable in injuries to the extremities, may under certain conditions, endanger the arterial blood supply. Manipulation and indiscriminate massage are harmful if they interfere with the complete rest necessary for early repair.

Two enemies of the injured worker must be denounced. They are appliances in common use: crutches and sling. The abduction aeroplane splint is the correct support for the upper extremity, insuring good circulation and a physiologic position of the shoulder joint, thereby eliminating the danger of overstretching the deltoid muscle. Unfortunately this brace seems to be disliked by many physicians and by most of the patients. The convenient sling, however, is only too often responsible for adhesions at the shoulder and atrophy of the deltoid muscle, resulting in a disability far beyond the expectation of the original injury.

The use of crutches should and can be avoided in the vast majority of injuries. Crutches are a poor substitute for effective support and immobilization of an injured limb, they eliminate the stimulus of protected weight bearing and interfere with normal body mechanics far more than is usually necessary. Even more important is the psychologic aspect. Generally considered as evidence of serious damage, crutches influence the patient's mental attitude in a direction opposite to our efforts for quick and complete rehabilitation. Return to work seems far remote if not impossible while crutches are used. He becomes accustomed to the idea that he requires assistance like a cripple, and in the end expects compensation for complete, perhaps permanent disability. Crutches are habit-forming; to free a person from this addiction is often a difficult problem.

Problem of Pain

The evaluation of pain constitutes another problem deserving especial attention in compensation cases. Although a subjective symptom, the degree of which cannot be accurately measured, the expression of pain is an important and sometimes the only lead for a diagnosis. As no two individuals are alike in their sensitivity, the perception of pain as well as the psychic reaction to it, differ according to the patient's physical and mental condition. The problem becomes still more involved in the case of compensable injury where the expectation of monetary remuneration for the damage suffered will not be without influence on the expression of pain. Especially where conspicuous evidence of trauma is lacking, the patient may feel compelled to dramatize his feelings in order to insure the desired attention and recognition. Aware of this situation and anxious to detect exaggeration or

malingering, the physician must weigh the subjective complaints and the objective symptoms in the light of the patient's personality, aided by his experience and a desire to be strictly impartial.

Apart from these considerations which play an important role in the physician's testimony in court, the persistence of pain is of great significance with regard to healing. By way of a reflex mechanism, pain actually interferes with repair, it causes rigidity of muscles and spasm of blood vessels, resulting in poor nutrition of the injured tissues and in muscle atrophy. Persisting pain may be the cause and not only a symptom of acute bone atrophy (Sudeck's atrophy), an unfortunate late complication of fractures or even minor injuries to soft tissues. Relief of pain is a prerequisite for quick recovery. It is not sufficient to subdue the patient's perception of pain by narcotics. Pain should be eliminated at the site of its origin by complete immobilization of the injured structures. If this fails, one must consider the temporary interruption of pain perception through local anesthesia. In severe sprains of the ankle, for instance, injection of novocain together with aspiration of the hematoma and followed by immobilization in a plaster-of-Paris cast will shorten the period of disability. If pain in the foot persists weeks after a fracture of the tibia is healed with solid bony union, this, as a rule, is not a sign of malingering but a symptom of Sudeck's atrophy, a serious condition requiring intensive treatment over a long period. Roentgen examination will confirm the diagnosis, showing the typical decalcification in spots of the skeleton of the foot remote from the site of the original injury. Sudeck's atrophy is by no means rare, but frequently overlooked. The physician should be familiar with this complication and explain its nature to the insurance carrier, who will find it difficult to understand what has happened when the injured worker, almost ready for re-employment, again becomes completely disabled and requires long and expensive treatment, which may include plaster casts and orthopaedic appliances.

It is frequently difficult to determine when treatment should cease. The ambulatory patient should continue with daily physical therapy as long as healing progresses. When a point is reached where the records from careful examination including measurements show no further progress, while on the other hand rehabilitation is still below expectation, it is a good plan to stop the treatments altogether, and to re-examine the patient after an interval of one or two weeks. If ground has been lost, physical therapy must be resumed energetically perhaps by different methods. If progress has continued, the patient should be encouraged to live an active life without treatment, and resume his occupation at the earliest possible moment. If the condition has remained unchanged during the interval, treatment should be resumed for a definite, limited time. This suggestion is prompted by the observation that the stimuli of continued intensive treatment may have exhausted the body's reserves both at the site of the injury and the entire system. Treatment may again become effective after a period of rest.

The goal of the treatment of the injured worker is restoration of normal function. It is successful if the injured is able to return to work without a physical handicap. This ideal cannot always be reached and permanent disability may ensue. In spite of this the worker may be in a position to resume his former occupation. Throughout the course of treatment the physician must strive to restore the worker's confidence in his ability to return to his job. Good psychologic guidance is a valuable asset in the management of compensable injuries. Naturally, the physician who has done his utmost for the rehabilitation of the injured worker would like to see him return to work. However, the great problem of re-employment remains be-

yond the medical profession. In this connection it may be worth while to report that re-employment is greatly facilitated where the amount of compensation for partial permanent disability is related to the earning power of the injured worker, as shown by his actual earnings.

Bibliography

1. McBride, Earl D.: Disability Evaluation. Principles of Treatment of Compensable Injuries, Philadelphia, London, Montreal, J. B. Lippincott Company, 1936.

2. Jordan, Henry H.: Orthopaedic Appliances. The Principles and Practice of Brace Construction for the Use of Orthopaedic Surgeons and Bracemakers, New York, London, Toronto, Oxford University Press, 1939.

Discussion

Dr. Isadore Levin (Washington, D. C.): Dr. Jordan brings up many points that I have noted to be important in dealing with compensation patients and in giving them physical therapy. I agree with him that most of them should be treated daily from the beginning, to get quicker and more satisfactory results. Some insurance adjusters give the impression that they would not like to have their cases given physical therapy every day, so as to save money. I find, however, that more and more adjusters are beginning to agree with me that daily treatments in the long run save money for the insurance company by curtailing the disability time from work and by having less permanent disability claims. It has been gratifying to me lately to have such dubious adjusters admit to me that they have found out that daily treatments save money in the end. I urge daily treatments in the beginning until the patient is definitely relieved from pain or seems to be regaining function of the injured part. From then on I advise treatment according to the needs in the particular case.

I have often found that compensation patients complain of pain more and longer than the injury would ordinarily be expected to cause. One reason I believe is that such cases are sometimes "kicked around" by other physicians before they are sent in for physical therapy and therefore get the impression that no one believes that they really have pain and begin to exaggerate and amplify their symptoms unconsciously to get some one to believe them. Many such cases, if it is demonstrated to them that their complaint is not being disregarded and are given proper treatment, will soon admit that they are better and will try to go back to work. Some of these individuals with back injuries and post-fracture manifestations, had received from other colleagues only infra-red treatments for a few minutes several times a week and still complained of pain and disability. But when hydrotherapy in the form of whirlpool baths and intelligent massage were given by intelligent technicians they improved rapidly. Of course, now and then compensation cases are seen that have no apparent pathologic process left as a result of the injury and have had sufficient physical therapy, when compared with similar non-compensation injury cases, and still complain of pain and disability. These I believe should be referred to a good neurologist for any signs of malingering. In some of these instances when the neurologist reports definite signs of malingering, and the patients are confronted with the findings and requested to go back to work, they have done so and no more has been heard from them. Some cases are really problems and will admit they are better until a suggestion is made that they go back to work, and then immediately pain is complained of again. Such individuals should also be sent to a neurologist.

In my experience, treating compensation patients sent in for special physical therapy has most of the time been a difficult job, because they must have been very difficult to handle or they would not have been referred. They either have had very little physical therapy or none at all. The case may have been an old injury and the physician and patient may be getting tired seeing each other and getting nowhere.

Special physical therapy in such cases has too often been thought of as a last resort instead of an early necessity. The specialist in physical therapy is supposed to show miraculous result very quickly or else the method is condemned as not worth anything.

One consolation is that the application of proper physical therapy in most instances has given good and quick results to the gratification of patients and insurance companies.

Dr. C. O. Molander (Chicago): In workmen's compensation the thing of paramount importance is the mental state in which these people are placed as the result of injury. They are fearful of their future and undecided as to just what course to pursue. The loss of funds during this period and the probable loss of their job make many of them play for as much compensation as the law will allow. This mental state, therefore, is a most important factor in their recovery, and as a result improvement is slow until a settlement has been obtained. When this phase has been cared for, recovery is often very rapid. This mental state, then, is the most difficult to deal with and until the injured person feels secure the chances for recovery are not great.

This group of individuals is by far the largest. There are those who are the malingering type and who have little

wrong but whose mental objective is to legally go the limit for all they can get regardless of any one concerned; and then we have the earnest worker who cooperates fully and does all in his power to get back on the job. Either of these extremes are in the smaller percentage classifications.

Knowing these mental states, it is well, as Dr. Jordan has rightfully stated, that one must be certain of the diagnosis and make an early decision with regard to percentage of disability and compensation award. X-rays should be taken early and these, together with the examination, make it possible to determine the relationship of injury to other conditions not the direct result of the injury. Here great difficulty and the importance of expert consultation cannot be overestimated.

The industry which checks on these injuries is primarily interested in the cost of the procedure rather than the end result, and often attempts to influence the physician in charge against his better judgment. This, in many instances, is a deplorable state and the patient suffers as a result.

The physical therapy prescribed is definitely affected by the mental state and treatments are often prolonged unnecessarily unless the physician is alert and realizes that early diagnosis and disability claims must be estimated as rapidly as possible and settlements made at the right time. Because of the mental state, occupational therapy can play a very important part in recovery for the reason that it can prove to the worker that he will return to his previous occupation or that another form of work will be substituted which will fit in with his future ultimate physical condition. Thus his earning power will be restored fully or nearly so. This gives him a return of confidence, his future is assured, and, as a result, recovery is rapid. Therefore, physical and occupational therapy play an important part also with regard to the mental state, if future compensation is taken care of adequately.

Dr. Henry L. Kahan (Gary, Ind.): There isn't much in the way of constructive discussion that a "general practitioner" from a small community can present after listening to all the facts regarding the subject as brought out by the essayist and my fellow discussants. However, several thoughts, directly or indirectly relevant to the subject, occurred to me that I thought worth while mentioning at this time. Naturally, the introduction of "Workmen's Compensation" in our country has been a great socialistic step forward, and on the collective shoulders of the medical profession has been placed the responsibility of reaping the greatest benefit for all concerned: the employer, the employee, the employee's dependent, and, yes, the Insurance Company and the Doctor. Seriously considered, that's some job, and no matter how trivial the accident, the best therapy is honest and intelligent treatment. In recent years, no man with any knowledge at all, will cast doubt that physical therapy has become a very valuable adjunct in the treatment of accident as well as disease. But physical therapy is expensive and loss of time may prove very costly, and here I am reminded that physical therapy could have been unnecessary if the pin scratch on the ribbon clerk's arm had not been neglected.

At this point, I'd like to re-emphasize with Dr. Jordan, the necessity of the immediate commencement of treatment following the accident, and toward this end, a better understanding with the Insurance Company and the employer in teaching the injured, the gains that may result by seeing the doctor now instead of tonight or Saturday afternoon. I think it is generally conceded, as an example, that a severely sprained ankle or wrist treated early with diathermy or radiant heat, will greatly reduce pain and prevent a lot of swelling and time of immobilization. Also, it becomes obvious that in an accident in which pain becomes a prolonged and dominating feature, early physical therapy may justly be the prevention of one more "dope addict."

The *modus operandi* in the treatment of industrial accidents naturally vary under different circumstances. Physical therapy, speaking broadly, necessitates the use of apparatus to help arrive at a definite goal, and as the racing pilot knows what power to expect from his automobile, so should the therapeutist make an honest effort to learn what his apparatus can do under the circumstance. And if he sincerely considers that his paraphernalia and training is insufficient to do justice to the patient, I feel sure that in the vast majority of instances, he will derive a personal satisfaction in referring the patient to someone better qualified, thus preventing another malpractice suit.

ARCHIVES of PHYSICAL THERAPY
OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL THERAPY

.·. EDITORIALS .·.

INTRODUCING THE EDITORIAL BOARD

Those who have followed the proceedings of the 19th annual session of the Congress either in person or by perusal of the report published in the September issue of the ARCHIVES have learned that there was created an editorial board consisting of five distinguished members of the Congress. While this board was not supposed to assume its functions until the beginning of this year, the concerned members volunteered to begin their labors immediately after the Cleveland session, and actually have rendered service since that time. It is deemed important to acquaint the readers with the reason, aims and personalities of this committee, because their influence will be felt through the pages of this publication for some time to come. But before doing so it may not be without interest to present the factors that led to the reorganization of the editorial group and to acknowledge the services rendered by several individuals.

Especial recognition and honor are due Dr. Albert F. Tyler, of Omaha, the founder of the ARCHIVES. Dr. Tyler early divined the role physical medicine would play in America and realized that its interests could be best furthered only by organization and proper presentation of scientific material. He brought great sacrifices in the establishment, maintenance and editorial control of the new journal for a number of years until he recognized that the publication should become the official organ of the Congress. He therefore transferred his personal property to this organization and retired from his editorial post, but continued as a friendly mentor to inspire his successors with the ideals that had actuated his enterprise.

He was followed by Dr. Abraham R. Hollender, who broadened the policies of his predecessor and made earnest efforts to place the journal on a sound economic basis. In 1929, it was realized that the task of both literary and managing editor coupled with the manifold duties as Executive Director of the Congress was too taxing for one man busily engaged in active practice. Thereupon the editorship was entrusted to the present incumbent, whose labors in association with those about to be mentioned have brought the ARCHIVES to its present high state of more than a national authoritative exponent of physical medicine.

Among the persons who assiduously labored in the development of our publication mention must be made of the constant aid by Dr. John S. Coulter. Though unofficial in his relation to the ARCHIVES, his official relation to the Council on Physical Therapy of the American Medical Association enabled him to become an invaluable collaborator. He not only provided the bulk of the material for abstracts but assisted in the shaping of complicated editorial policies.

In a similar unofficial capacity, Miss Marion G. Smith rendered splendid services in a secretarial and organizational capacity. It is not generally known that she devoted much time and energy to manifold duties in connection with the publication.

With this as a background it becomes clear that one of the reasons for the creation of an editorial board was to lighten the constantly increasing tasks and responsibilities of the editor. This step is in keeping with the publication policies of the American Medical Association. As in all growing important enterprises of a public nature, it became evident that the enlarging scope of the journal

involving many complicated problems arising in its diverse scientific sections, became too detailed to rest upon the shoulders of any one man in our organization. The decision to organize an editorial board naturally met with the approval of the general membership of the Congress. This augmentation of our editorial group reflects the wisdom of the membership and implies a distinction to those who have been selected and have accepted the responsibility in the cause of physical medicine.

It should be borne in mind that apart from the need of arriving at sound decisions in matters of policy, the board will aid in the selection or approval of such original contributions that have been found meritorious of publication, and in the preparation of editorials which will be identified by the initials of the writers. This will be no small task previously shouldered by the editor, because even the mere putting of contributions into good literary form often entails many hours of painstaking effort. It is the intention to encourage The Editorial Board to take a share in the many divisional labors, such as the editing of abstracts, the review of desirable books, the culling of timely scientific news items allied to medicine, and the like.

Of the men selected for the new board, all represent the highest ideals and distinction in our field. Organized on a service basis of five years tapering down to one year in the order of seniority, there naturally will be a continuous service requiring each year the selection of a new member or retention of any old one, thus assuring a well-knit and efficient body.

As has been published on the title page of the past few issues, the men so selected are: Dr. Disraeli Kobak as editor-in-chief, Dr. Earl C. Elkins, of Rochester, Minn., Dr. Richard Kovács, of New York, Dr. Fred B. Moor, of Los Angeles, and Dr. Walter M. Solomon, of Cleveland.

A word about their personalities. Dr. Elkins is well known as one of the younger specialists in physical therapy whose clinical experience is wide and searching in quality. Dr. Kovács, who is also Secretary of the Congress, enjoys an enviable reputation as the author of specialistic textbooks and monographs. As editor of the Year Book of Physical Therapy he keeps his finger on the national and international pulse of physical medicine. Dr. Moor, First Vice-President of the Congress, occupies the chair of therapeutics at Loma Linda University, and is generally known as a man of vast experience and ripe judgment. He can be relied upon to assure younger authors an impartial hearing with regard to the merits of their contributions. Dr. Solomon is equally well known as an outstanding specialist in physical medicine whose rich experience and intensive studies of contemporary problems will prove invaluable to our publication.

With such men to aid in steering the rudder of the ARCHIVES, its course across the path of scientific progress will safely head for the port of successful achievement.

SHORT WAVE DIATHERMY AND NASAL SINUSITIS

It cannot often enough be emphasized that while physical therapy represents a definite specialty, many of its facilities find wide and special applicability in other recognized divisions of clinical medicine. This applies particularly to short wave diathermy, because its physiologic effects have proved of therapeutic value in inflammatory processes no matter which organ or structure is accessible to its beneficent healing quality. By this it is not inferred that this agent is in itself sufficient definitely to control all such pathologic phenomena, but even as an adjunct to surgical or other forms of intelligent and purposive intervention it has been established to be of sufficient value not to be omitted in the general scheme of scientific therapy.

No one has claimed short wave diathermy to be a panacea, and there are many in our ranks who were among the first to voice alarm at the abuse of this potent agent through its indiscriminate application by the zealous and the zealots, who have used and abused this measure and arrived at conclusions both bizarre and rational.

As a matter of fact the fundamental principle involving the rationale of short wave diathermy has been established by authoritative investigations within or closely related to physical medicine. The extensive literature on this one problem during the past decade clearly shows that the painstaking labors and polemic discussion with reference to technical details have emanated from sources no other than those making up the body scientific of our Congress or like organizations. It is through these labors that no question is left with regard to the manner by which short wave diathermy affects normal and abnormal living structures. The laws of thermodynamics in biology have been shown to be immutable and as a corollary all human structures no matter where situated must uniformly obey these laws provided the conditions under which they are subjected are in accord with the exactions of proper technic.

What has been stated above is an important preamble to a situation recently created by the so-called conservative stand taken by at least one rhinologist with reference to the clinical limitation of short wave diathermy in the treatment of sinusitis. While it must be conceded that in the field of rhinology the specialist must be given his due place as an authority within the narrow confines of that field, it is equally axiomatic that when it comes to the application of physical measures authorities in the latter field must have at least an equal voice. To be more specific, Hollender's impressions presented elsewhere in this issue[1] must at once arouse a general interest of the rhinologist as well as those specialistically interested in this agent. Conceding the right of any clinician to form his own opinions no matter how conservative or negativistic they may be, this in the last analysis must remain a one man opinion until confirmed by a preponderance of fact based on collective experience. The issue raised by Dr. Hollender is virtually no issue at all. No one has denied the demonstrated value of short wave diathermy in acute nasal processes, and no one has scientifically demonstrated its value in chronic sinusitis. It is a matter of common knowledge that short wave diathermy has little clinical value in any chronic process in which the tissues have become pathologically fixed. Nevertheless, as the author admits there are acute exacerbations for which diathermy is effective without materially affecting the anatomic changes of a chronic nature. Under the circumstances it would seem more appropriate to stress the value of a given remedy or measure rather than try to discourage a large group of conscientious general practitioners. Dr. Hollender implies that no one should undertake this form of treatment for sinusitis except rhinologists or practitioners who obtain specialistic cooperation. When it is considered that sinusitis is not only a widespread but most often easily diagnosed disease even by physicians deprived of institutional or specialistic advice, it should be evident that any one practitioner thoroughly familiar with the technic of short wave diathermy would or should be in a position to check the progress of that affection with the same surety as the rhinologist. There is no denying that specialistic training and skill are highly desirable, but all things being equal no specialty can be surrounded by an impenetrable fence to exclude the main body of the medical profession. There are many specialistic problems which have been, are being, and will be effectively aided by those who are familiar with the biologic fundamentals and the very technical approach

of physical measures in the management of disease. This holds good also for the various types of nasal sinusitis.

Reference

1. Hollender, A. R.: Present Status of Short Wave Diathermy in Nasal Sinusitis, Arch. Phys. Therapy **22**:12 (Jan.) 1941.

ELECTRICAL CONVULSION TREATMENT OF MENTAL DISORDERS

Since the convulsive treatment of schizophrenia was introduced by Meduna in 1934, many excellent results have been reported in the treatment of various psychoses with this technic. Moreover, the insulin-induced hypoglycemic shock described by Sakel has also had wide application. Now comes another variant of convulsive irritative therapy in the form of an electrically induced epileptic fit. In 1937 an Italian physician, Cerletti, reported to the Psychologic Congress at Milan that an electric current passed through the head of a dog produced a typical epileptic fit. His collaborator, Bini, asserted that the brain of a dog had tolerated, without any apparent damage, a current of 3,000 milliamperes. The animal died when the duration of the passage of the current was prolonged to sixty or ninety seconds. Bini believes that the duration of the passage of the current is more important from the point of view of any damage done to the tissue of the brain than the tension of the current. However, many physicians and physiologists who have had experience with such technics consider the assertion unbelievable and feel that under any circumstances the passing of electric current through the brain is a most hazardous procedure.

After much work on the technical details of their method, Cerletti and Bini applied the method to patients with schizophrenia. They report that the electrically induced shock was characterized by an immediate and absolute loss of consciousness, which was followed in from two to four seconds by a convulsive fit. The patients are said to have slept longer than after metrazol shock and to have been of good spirits on awakening. The authors also report that the patients had no recollection of their experience and that the state of excitation frequently observed with metrazol therapy was absent. In some instances the shocks were repeated after several minutes. In a later report Fleming describes the apparatus used and the technic of induction shock. The chief advantage claimed for electrical shock over metrazol shock is the instantaneous loss of consciousness and an absence of such surgical complications as dislocations, which occur with metrazol therapy. Some investigators, however, fail to see much difference in the incidence of complications with the two methods, and Bingel and Meggendorfer particularly report dislocations of the jaw and the shoulder joint and fracture of the humerus and the scapula. Various investigations both in this country and abroad indicate that at least 1,000 persons have already been subjected to this technic.

In the meantime the possibility of serious danger associated with such a technic should not be overlooked. The passing of electric current through the body is always a matter for careful consideration. If the heart is included within the field, low tension currents are dangerous. True, if a current is passed from one to the other side of the head the percentage of current passing through the heart is much less than if the current is passing from arm to leg. In many studies which have been made on the effect of electric current on the brain it has been shown that, when the source of the current is a spark coil at 140 cycles per second with a peak voltage at the break of 220 volts and a resistance of the animal body of 1,640 ohms, a duration varying from three to fifty seconds may result in capillary hemorrhages, ganglion cell changes of swelling and shrinkage satellitosis, gliosis and demyelinization. Morphologic changes in the brain may of course occur with both insulin and metrazol shock therapy. Sufficient data are apparently not yet available to determine whether irreversible changes are produced in patients after several shocks.

It should be obvious from what has been said that electrical shock to the human body may produce fundamental changes in the tissues which are sufficient to threaten life itself. Certainly before extensive clinical application is made of the passage of electric current through the brain, careful histopathologic studies of the brain under varying conditions should be attempted. Finally, the Council on Physical Therapy may well give careful study to the various devices employed in this technic with a view to checking the adequacy of safeguards over the current and voltage and technic of application involved in this procedure. — [J. A. M. A. **115**:462 (Aug. 10) 1940.]

REPORT OF THE FIRST ANNUAL MEDICAL MEETING OF THE NATIONAL FOUNDATION FOR INFANTILE PARALYSIS *

The National Foundation for Infantile Paralysis held its First Annual Medical Meeting at the Waldorf-Astoria Hotel, New York City, on November 7 and 8, 1940. Attending the meeting were the members of the medical advisory committees, the grantees of the Foundation, and the Board of Trustees. Reports of the activities of committees and grantees for the preceding year were presented, and recommendations were made for grants for 1940-1941.

The Foundation is concerned with promotion and furtherance of research on all phases of infantile paralysis. Studies are being carried on through grants from the Foundation on problems of epideminology, virus research, relationship of nutrition to poliomyelitis, and the prevention and treatment of the disease. In addition, a program of professional and lay education has been promoted.

Research On the Virus

The Committee on Virus Research reported that studies were being conducted to determine the nature of the poliomyelitis virus. Paul F. Clark, Ph.D. The University of Wisconsin, has concentrated the virus infected material obtained from spinal cords of monkeys so that infection may be produced in dilution of one part to ten million. Dr. Hubert S. Loring, Leland Stanford University, who has been studying the purified and concentrated virus, concluded that the virus is protein in nature, or contains protein material. The properties and chemical nature of the virus will continue to be studied.

Drs. John R. Paul and James D. Trask, Yale University School of Medicine, reported the finding of the poliomyelitis virus in stools of patients, contacts, and in sewage collected from epidemic areas. Dr. S. D. Kramer, Michigan Department of Health Laboratories, reported the occurrence of healthy carriers in an institutional outbreak in Detroit. Karl F. Meyer, Ph.D., and Beatrice Howitt, The George Williams Hooper Foundation of the University of California, conducted detailed laboratory studies of material collected from patients, contacts, and the environment during an epidemic in Tacoma, Washington.

Reports were made of the efforts to produce infection with poliomyelitis viruses in animals other than the monkey. This confirmed the previously reported findings of Armstrong to the effect that the Lansing strain could be made to produce infection in various cotton rats. All investigators, excepting Dr. John A. Toomey of the Western Reserve University School of Medicine, reported that only this one strain could be made to produce disease in the cotton rat. Toomey, however, had success in growing, by a special technique, several other old as well as newly isolated strains in the cotton rat. This observation may be of the utmost importance in conducting further clinical and epidemiological studies.

The distribution of the virus in the body was reported by Drs. R. D. Lillie, The National Institute of Health in Washington, Albert B. Sabin, University of Cincinnati, John F. Kessel, University of Southern California, and others. All showed that the virus could be routinely recovered from central nervous tissue of human fatal cases and from experimental animals, and that excepting tonsils, adenoids, and lymph gland tissue, no other part of the body was shown to harbor the infection.

Studies of Immunity

Studies on the development of active and passive immunities were reported. *All attempts at producing immunity have thus far met with failure.* Dr. Kessel reported that one infection did not routinely protect monkeys from subsequent disease on re-inoculation. He also made the observation that there was but little relationship between the presence of neutralizing antibodies in the blood stream and immunity to the disease.

Chemotherapy

Studies in chemotherapy were reported by C. C. Young, Ph.D., and Dr. S. D. Kramer of the Michigan Department of Health Laboratories. While they have not found a chemical that will do for poliomyelitis what sulfanilamide has done for certain bacterial infections, leads have been discovered.

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* To the Editor: I am enclosing herewith a copy of the Report of the First Annual Medical Meeting of the National Foundation for Infantile Paralysis.

It is the desire of the Foundation to keep the medical profession informed of our activities and it is quite likely that the readers of your publication might be interested in this Report.

The National Foundation was organized on January 3, 1938, for the purpose of leading, directing and unifying the fight on every phase of this disease.

Sincerely yours,

Basil O'Connor, President.

Investigation of After Effects

Reports were received from grantees who are studying the effects of the disease and the methods of prevention of damage. Dr. Donald Young Solandt, University of Toronto, concluded that the muscular fibrillation resulting from nerve destruction is not the primary cause of atrophy of paralyzed muscle. Dr. Clinton N. Woolsey, Johns Hopkins University School of Medicine, concurred in these results, but Dr. Samuel Soskin, Michael Reese Hospital in Chicago, felt that in the animals which he studied fibrillation did play an important part in the degree of atrophy resulting from nerve destruction.

Physiological changes in muscular atrophy are being studied by Dr. I. Arthur Mirsky at the Jewish Hospital in Cincinnati, by Dr. A. T. Milhorat at the Russell Sage Institute for Pathology in New York, and by Professor Harry M. Hines at the State University of Iowa. None of these has pursued the investigations far enough to warrant any definite conclusions.

Gross and microscopic pathological studies of paralyzed muscles carried on by Dr. Herbert E. Hipps, The Crippled Children Hospital in Marlin, Texas, showed that occasionally muscles developed a band like form of degeneration, and that when mattress sutures were used to connect the muscle above and below these bands, good functional results were obtained.

Several instruments were presented for the more accurate testing of muscle strengths. Dr. A. A. Schmier, The Hospital for Joint Diseases in New York City, developed a muscle tester and recording apparatus suitable for measuring in pounds and ounces the pulling power of most of the muscles of the body. Dr. Leo Mayer of the same hospital has developed a table designed to evaluate in the same terms the muscle power of the trunk.

Surgical Treatment

Several studies have been completed and others are still being conducted that measure the end results of various forms of surgical and conservative treatment. Drs. George E. Bennett and Raymond E. Lenhard, The Children's Hospital School in Baltimore, concluded that if the maximum benefits of physiotherapy are to be secured patients must be under such care within six months of the onset. They further showed that 97 per cent of all weakened or paralyzed muscle regain the maximum possible strength within eighteen months after onset of treatment. Dr. William B. Carrell, Texas Scottish Rite Hospital in Dallas, confirmed these observations. In addition, he concluded that rest with physiotherapy in the hospital had no advantage over similar treatments given in the home. Hospital care over long periods was of decided advantage only when underwater treatments were used. Dr. Carrell also pointed out the disadvantages of plaster casts continued over periods of from four to six months, even when the patients reported for frequent reapplications of the casts.

The value of rest treatment was further emphasized by laboratory studies on infected monkeys. Dr. Sidney O. Levinson, The Michael Reese Hospital in Chicago, showed that monkeys forced to exercise during the active disease process had not only a greater amount of paralysis but also a higher death rate.

Much work has been done on study of bony deformity, such as scoliosis and unequal leg lengths, resulting from infantile paralysis. Since years of observation of individual patients are necessary, only progress reports could be made at this meeting.

Epidemiology

Reports were rendered on the activities of the Foundation in epidemic areas. It is not the purpose of the Foundation to provide medical care to patients, yet it has rendered certain assistance to communities and hospitals by supplying splints, Bradford frames, and by making respirators available. Studies of epidemics were made in a few areas upon the request of and with the consent of the health officers. These studies have progressed only far enough to point the way for more elaborate and exhaustive work of the future.

Educational Activities

To inform both professional workers and the public of certain aspects of this disease an educational program has been conducted. An exhibit at the New York World's Fair was viewed by over five million persons. Scholarships have been made available through the National Research Council to physicians wishing to specialize in orthopedic surgery or virology. Other scholarships have been made available to nurses wishing to specialize in the orthopedic aspects of public health nursing. Graduate instruction in physiotherapy also has been provided.

Booklets have been prepared and widely distributed dealing with the use of the respirator, the nursing care of poliomyelitis patients, and other phases of the problem.

Scientific investigation of the possible relationships existing between the state of nutrition and the development of infantile paralysis has been undertaken. It was not deemed expedient to limit these studies to poliomyelitis, but rather to include the entire field of infectious diseases.

At this meeting additional grants were recommended for continuation of existing studies or new investigations in the amount of $137,350.00.

As the result of elections, the following chairmen of medical committees were appointed:

The Committee on Virus Research
Thomas M. Rivers, M.D., Director of The Hospital of The Rockefeller Institute for Medical Research, New York City.

The Committee on Research for the Prevention and Treatment of After-Effects
Philip Lewin, M.D., Associate Professor, Orthopedic Surgery, Northwestern University Medical School, Chicago, Illinois.

The Committee on Nutritional Research
James S. McLester, M.D., Professor of Medicine, University of Alabama School of Medicine, Birmingham, Alabama.

The Committee on Epidemics and Public Health
Herman N. Bundesen, M.D., Commissioner of Health, Chicago, Illinois.

The Committee on Education
Max M. Peet, Professor of Surgery, University of Michigan Medical School, Ann Arbor, Michigan.

The Committee of Medical Publications
Morris Fishbein, M.D., Editor, The Journal of the American Medical Association, Chicago, Illinois.

Professor d'Arsonval Dead

Just as we are going to press we learn of the recent death of Professor Arsene d'Arsonval. While this news is not entirely unexpected since recent reports revealed his failing and precarious state of health, it comes nevertheless as a shock since this patriotic savant was forced to see his country conquered for the second time in his life. An obituary of this great man will be published in the next issue, together with eulogies by some colleagues who enjoyed his friendship.

SCIENCE, NEWS, COMMENTS

1941 Officers—Section on Physical Therapy Medical Society of the County of Kings

At a recent meeting of the Section on Physical Therapy, the following were elected officers of the section for the year, 1941:

John J. Hauff, M.D., President.
Jacob Gutman, M.D., Vice-President.
Samuel A. Warshaw, M.D., Secretary-Treasurer.
Executive Committee:
Jerome Weiss, M.D.
Harold Neifeld, M.D.
Harry T. Zankel, M.D.

Regular meetings will be held on the second Thursday in the months of January, March, May and October at the Medical Society of the County of Kings Building, 1313 Bedford Avenue, Brooklyn.

Southern California Academy of Physical Medicine

The November meeting of the Academy was held on Wednesday evening, November 27, 1940, at 8:00 p. m. in the Conference Room of the Hollywood Presbyterian Hospital.

Dr. *J. C. Risser* spoke on "Exercise and Posture as Factors in Medical Practice."

In addition there was presented a new motion picture covering some phases of muscle training.

It is planned to devote several meetings this coming year to the study of muscle function and muscle training and their practical application to practice.

JOHN SEVERY HIBBEN, M.D., President.
STUART C. KNOX, M.D., Secretary.

Section on Physical Therapy Medical Society of the County of Kings

The next regular meeting of the Section on Physical Therapy of the Medical Society of the County of Kings will be held in the Medical Society Building, 1313 Bedford Avenue, Brooklyn, N. Y., Thursday, January 9, 1941, 8:30 p. m.

The program will be as follows:

1. Use of High Frequency Currents in Office Gynecology, *H. J. Goubeaud*, Jr., M.D., Holy Family, St. Mary's, and Kings County Hospitals;

2. The Use of Iontophoresis in Pelvic Inflammatory Diseases, *A. H. Rosenthal*, M.D., Kings County Hospital;

3. Resumé:

Edward A. Horwitz, M.D., Mount Sinai, Beth Israel Hospitals. The medical profession is cordially invited.

JOHN J. HAUFF, M.D., President.
SAMUEL A. WARSHAW, M.D., Secretary.
1373 Ocean Parkway, Brooklyn.

New York Physical Therapy Society

The New York Physical Therapy Society will hold a joint session with the Section of Historical and Cultural Medicine of the Academy of Medicine, Wednesday evening, January 8, 1941, at 8:30 p. m., at 2 East 103rd Street, New York, N. Y.

The following program is planned:

I. Scientific Session. — A. August Kekulè, First of the Modern Chemists. *Herman Goodman*, M.D. Discussion, *Victor Robinson*, M.D. (by invitation), *Chester Myers*, M.D. B. Celebrated Figures in Electrotherapy. *Richard Kovács*, M.D. Discussion, *Madge C. L. McGuinness*, M.D., *Iago Gladston*, M.D.

All physicians are welcomed.

II. Executive Session. — Annual meeting—Election of Officers.

Ramsay Spillman, M.D., Chairman, Section of Historical and Cultural Medicine.
Claude E. Heaton, M.D., Secretary.
LEWIS J. SILVERS, M.D.,
President, New York Physical Therapy Society.
64 East 87th Street, New York, N. Y.,
MADGE C. L. MCGUINNESS, M.D.,
Secretary.
1211 Madison Avenue, New York, N. Y.,

Meeting of the Eastern Section

The Eastern Sectional Meeting of the American Congress of Physical Therapy will be held in conjunction with the New York Physical Therapy Society and the Pennsylvania Physical Therapy Association at the Auditorium of the Polyclinic Hospital, 335 West 50th Street, New York City, Saturday, April 5. The scientific session will open at 2 P. M., followed by a dinner for guests and members about 6:30 P. M. The program of the evening will be started at 8:15 P. M. and presided over by Chairman Dr. A. A. Martucci of Abington Memorial Hospital, Abington, Pennsylvania. Dr. Madge C. L. McGuinness, 1211 Madison Avenue, New York City, Secretary.

Reported Activities of the New York Physical Therapy Committee

John D. Currence, Chairman of the Committee on Physical Therapy reports in the *New York Medical Week* that:

Regular meeting of the Special Committee on Physical Therapy was held in room 552 of the Medical Society of the County of New York on Thursday, November 14, at 4 p. m.

Present were Drs. Auster, Bierman, Kovacs, McGuinness and Currence, Chairman. Excused were Drs. Cipollaro, Hirsh and Titus. Absent were Drs. Bull and Oberwager..

Dr. Bierman, Chairman of the Subcommittee on Massage reported as follows: The Subcommittee has been in contact with the State and Municipal

authorities in the effort to improve the present status of the Massage operators in this city.

It has been informed that the Department of Education is sympathetic toward the idea and that it would welcome the cooperation of the Massage Committee in the effort to establish standards for schools of massage. Such schools would be regarded as trade schools. The New York City Department of Health, through its representative, informed the members of the Subcommittee that the city would not recognize such schools because it is not sufficiently well equipped to establish standards and see to it that such are adhered to.

The Commissioner of Licenses in this city informed the members of the Subcommittee that his power is limited to the issuing of licenses in accordance with standards established by other departments of the city government. The Department of Health requested the assistance of the committee in the preparation of questions to be used in the examination of candidates for Massage Licenses. The committee has cooperated with the Department of Health and supplied it with a series of questions for this purpose.

Further discussion was held and plans made relative to the unethical radio advertising on physical therapy apparatus.

There were discussion and plans formulated to further improve the requirement standard for technicians in hospitals.

New Blood Test Will Help Predict Course of Anemia

A new blood test which will help doctors diagnose the ailment in a patient with jaundice and also predict the course of the disorder has been devised by Dr. J. L. Irvin and Dr. C. G. Johnston, of Wayne University College of Medicine, and Dr. E. A. Sharp, of Parke, Davis & Company and the Harper Hospital, Detroit. The test might tell, for example, whether the jaundice is due to liver disease or to one, and which one, of several kinds of anemia.

The test, reported to the Central Society for Clinical Research, is said to give for the first time a method of making dependable quantitative determinations of the bile acids in the blood. The amount of these, the test shows, is about one-tenth to one-twentieth greater in anemias characterized by destruction of red blood cells than the amount needed to destroy normal red blood cells in the test tube.

Whether this concentration of bile acids in the blood is the cause of the red cell destruction is the next point to be determined. — *Science News Letter.*

"Prolon" Latest Addition to Names of New Fibers

Get acquainted with "prolon." It is a new name for what has been called "casein wool." Perhaps soon you will buy clothes, blankets, etc., made of it.

This name is the latest addition to the family which now includes nylon, vinyon, rayon, celanese, and the other so-called "synthetic" fibers.

It is suggested by F. C. Atwood, of Atlantic Research Associates. (*Industrial and Engineering Chemistry.*)

Prolon is made from casein obtained from milk, soybean or other sources. — *Science News Letter.*

Fat Men Can Drink More Than Can Thin Men

Good news, or perhaps it is bad news, for fat men: From Berkeley, Calif., comes the observation by Dr. Emil Bogen, National Safety Council committee member studying intoxication tests, that fat men can drink more than thin men under normal conditions. The reason is that intoxication is caused by concentration of alcohol in the blood stream; fat men usually have more blood than their thinner brothers engaged in alcoholic exercises. — *Science News Letter.*

New Chemical Treatment Relieves Ménierè's Disease

A new chemical treatment that brings swift relief from acute attacks of Ménierè's disease has been announced to the medical world by Drs. C. H. Sheldon and B. T. Horton, of the Mayo Clinic. (*Proceedings,* Mayo Clinic, Jan. 10.)

Ménierè's disease, although probably unknown to the majority of laymen, is frightfully distressing to those afflicted with it.

"Recurrent attacks of sudden severe vertigo (dizziness), nausea and vomiting, tinnitus (ringing in the ears) and deafness" is the description given by the Mayo Clinic physicians and other authorities. The attacks may come at shorter and shorter intervals and in severe cases the patient may be confined to his bed.

The chemical, histamine, is used in the new treatment developed at the Mayo Clinic. Histamine acid phosphate dissolved in salt solution is injected into a vein, the injection taking about one and one-half hours.

"The first patient so treated, who had been confined to bed for a period of three weeks because of Ménierè's disease, was promptly relieved of all symptoms and was able to get up immediately after the injection was stopped and walk about in a perfectly normal manner," Drs. Sheldon and Horton report. This patient has remained well since the treatment, a period of about two months. Similar good results were obtained in 14 other cases.

A brain operation in which the nerve of hearing on the affected side is cut has been a successful, if drastic, method of relieving the condition completely. Medical treatment using ammonium chloride and a low salt diet has also been reported to give good results. But the "almost immediate response to treatment with histamine makes this method particularly valuable when the vertigo is of great violence and the vomiting severe," Dr. H. W.

Woltman, of the Mayo Clinic, points out. — *Science News Letter.*

British Nutrition Expert Gives Potato a Hand

Advice to Britishers in wartime from Sir John Boyd Orr, expert on nutrition, leader in the League of Nations Committee on nutrition, gives the lowly potato a hand:

After milk (and Britain has enough milk to drink a fifth more) and vegetables (and Sir John says eat twice as much) the most important food produced in the tight little isles is the potato. It is a protective food, the main source of one of the vitamins. In England an average of only 4 pounds of potatoes per week per person are eaten. Some countries eat twice as much.

"Some women are afraid to eat potatoes because they think they are fattening," remarked Sir John. "This is nonsense: 1 lb. of bread and butter is more fattening than 4 lbs. of potatoes. If you think you are too fat, cut out the bread and butter and eat potatoes and vegetables. In a time of threatened food shortage, the potato is by far the most important crop, because, in addition to its special health value, it gives the highest yield of food per acre. An acre of potatoes gives twice as much food as an acre of wheat." — *Science News Letter.*

1940 Progress in Medical Sciences

Development of a new measles vaccine and its success in clinical trials on a small group of children was announced.

New evidence of the importance of thiamin, or vitamin B_1, not only for preventing disease and minor degrees of ill health, but for increasing the alertness and capacity for physical work in persons of ordinary good health was obtained from diet studies on human subjects.

Lack of riboflavin, one of the B vitamins, in the diet was discovered to cause keratitis and cure of the condition by riboflavin was announced.

Synthesis of pantothenic acid, one of the B vitamins, and its identification as an adrenal gland-protecting factor for rats, and its usefulness in human nutrition were announced.

A new vaccine from influenza and distemper viruses was found to give ferrets solid immunity against several strains of influenza and was tried on humans during an epidemic in Puerto Rico but without definite conclusions.

A second virus cause of influenza, to be known as Influenza B virus, was discovered and found to cause epidemics in alternating cycles with Influenza A virus.

Sulfathiazole was announced as an improved remedy for pneumonia and as a valuable remedy for staphylococcal infections and as a possible cure for bubonic plague.

Evidence of regression of cancer achieved by treatment of patients with fast neutron rays from the cyclotron was reported.

Neutrons slowed down by boron proved five times as effective as fast neutrons in destroying cancer tissue in test-tube experiments and cured transplanted cancer in mice.

"Air bends" or aeroembolism, occurring in rapid ascents to high altitudes, can be prevented by oxygen inhalation treatment before taking off.

Signs of heart damage due to oxygen lack were discovered in flyers at altitudes as low as 5,000 feet.

A diet, adequate to provide proper nourishment for a year at a cost of less than two dollars per year, has been announced as satisfactory except for the deficiency of one vitamin, which can be provided with the addition of tomato juice, and calories and bulk to satisfy stomach hunger.

A "pocket size" emergency oxygen inhalation apparatus for parachute descents from high altitudes was devised.

Five groups of eye defects significant in certain types of work and new tests for detecting them were announced together with a theory of job selection on an eyesight basis.

A vanishing cream that protects against poison ivy was developed.

A serum for treating Rocky Mountain spotted fever was developed.

Two kidney extracts were reported to give relief from high blood pressure.

Isolation from soil bacilli of chemicals capable of destroying a large range of pathogenic microorganisms and promising results with the use of one of them, gramacidin, in treatment of chronic bovine mastitis, were announced.

Successful vein grafting or splicing was accomplished with the aid of the anti-blood clotting chemical heparin.

Sulfanilylguanidine was announced as a promising remedy for bacillary dysentery and other intestinal infections.

A muscle-splicing operation, in which bands of diseased tissue within the muscles were removed, was devised for rehabilitating useless muscles of infantile paralysis victims.

Test-tube transformation, for the first time, of living mammalian cells into cells of apparently radically different type which may be cancer cells was achieved by methylcholanthrene treatment in search for the secret of the change of normal cells into cancer cells and suggested that a change in the cell membrane may be crucial to the transformation of normal to cancer cells under chemical treatment.

Cancer-causing substances, it was announced, have been extracted from the presumably healthy livers of cancer patients and, apparently for the first time, from human breast cancers.

Cancer cells were turned toward normal in metabolic activity by starvation treatment of the cells aided by insulin.

Financial aid to indigent cancer patients and also establishment and maintenance of cancer clinics, hospitals or laboratories will be possible through the reorganization this year of the American Society for the Control of Cancer.

Zinc peroxide treatment was used successfully to relieve pain and clear up infected ulcers in hopeless cancer patients, enabling some of them to continue with needed irradiation treatment.

A new route by which cancer cells and disease germs can spread through the body, by-passing the heart and lungs, and thus in the case of cancer giving a false sense of security in prognosis based on lung involvement, was discovered in the valveless vertebral veins.

Discovery that glutamic acid occurs naturally in both right-handed and left-handed forms refuted the idea that appearance of the left-handed form in the body was an indication of cancer.

A grant of $35,000 yearly for two years was made by the National Foundation for Infantile Paralysis to the National Research Council for fellowships in infantile paralysis research.

Antibodies that can inactivate influenza virus were discovered in human nasal secretions and seen as a possible protection along with a change seen during influenza in the cells of respiratory mucous membrane of ferrets.

Cirrhosis of the liver in rabbits was produced by a diet lacking in a substance found in yeast and thought to be choline.

Evidence showing that the liver is of fundamental importance in the formation of prothrombin and in the metabolism of vitamin K was reported.

Improvement in Parkinson's disease (paralysis agitans) following treatment with pyridoxine, or vitamin B_6 was announced.

Success in carefully controlled treatment of prostate gland disease with the synthetic female sex hormone, stilbestrol, in dogs was announced.

A hyperimmune rabbit serum for treatment of equine encephalomyelitis was developed and found to give good results in laboratory animals.

Aluminum treatment of silicosis in human patients was begun and early encouraging results were reported.

Success in treatment of muscular dystrophy, amyotrophic lateral sclerosis, peroneal muscular atrophy and amyotonia congenita with vitamin E was reported.

The mouse anti-baldness dietary factor was identified as inositol.

Poor diet was found to decrease the resistance of young rats to a neurotropic virus, suggesting that dietary deficiency may be a factor in virus diseases such as infantile paralysis.

Treatment with vitamins E and B was reported to have restored the function of muscles disabled by infantile paralysis and other diseases.

Thiamin was discovered to be an antidote for the depressing effects of tropical heat.

A new role for thiamin, that of protecting blood vessels from damage, was discovered.

Deficiency of vitamin B_6 (pyridoxine) and potassium caused heart muscle damage and death in young pigs and rats.

Discovery of a new, unidentified B vitamin, necessary to prevent slipped tendon disease or perosis in chicks, was announced.

Sulfamethylthiazole was announced as a cure for staphylococcal septicemia and as a pneumonia remedy.

Sulfanilamide was reported to prevent scarlet fever and to be successful in treating recurrent lymphocytic choriomeningitis and an eye infection from the virus of venereal lymphogranuloma.

Electron microscope studies showed that the streptococcus has a rigid outer membrane accounting for the grouping of these germs in chains.

A world-wide influenza epidemic was predicted by many authorities for 1940-1941 on the basis of 25-year pandemic cycles.

Encouraging results in attempts to protect animals against infantile paralysis by injecting a vaccine into the brain and spinal cord were announced.

Tonsillectomy appeared to predispose to infantile paralysis, a survey showed.

Infantile paralysis epidemics were linked with a recent trend in sewage disposal methods, especially in small towns; and chlorination of drinking water and swimming pool water as now practiced was found insufficient to kill the infantile paralysis virus.

Successful vaccination of monkeys against infantile paralysis with a virus that causes the disease in mice was reported.

First proved epidemic in the United States of Australian "Q" fever was announced with the suggestion that the organism is the cause of many cases of atypical pneumonia.

An experimental vaccine for protection against "Q" fever was developed.

A record of 401 operations for relief of Ménière's disease with one death and 400 permanent cures was announced.

Relief of Ménière's disease by the chemical histamine in 49 patients was announced.

A hitherto unknown enzyme in the blood which breaks down heroin and other morphine compounds was discovered.

Apparently permanent cure of diabetes in cats was achieved by insulin treatment in experiments giving new knowledge of the tissue damage in diabetes and emphasizing the importance of early, thorough treatment of the disease in humans.

Inhalations of 100 per cent oxygen were found to give relief from attacks of angina pectoris.

Muscle storage of iron was discovered for the first time in studies with artificially radioactive iron.

A new pneumonia germ, pneumococcus Type 33, was discovered and a serum for treating it was prepared.

Large scale field trials of two typhus fever vaccines were started in Central Europe.

A research unit to be concerned entirely with problems of aging was organized at the U. S. National Institute of Health.

Promin, a new sulfa drug, showed promise as a remedy for experimental tuberculosis in guinea pigs.

Isolation of extracts from the kidneys, one of which lowers blood pressure, another of which raises blood pressure, others which produce thrombosis and still others which produce hemorrhage, is expected to throw light on the role of the kidneys in various manifestations of cardiovascular disease.

England added thiamin to its flour as a war nutritional measure.

Not Science, But Philosophy and Religion Failed World

Answering those critics who have blamed science for the horrors of modern warfare which threatens civilization, Dr. Harlow Shapley, director of the Harvard Observatory and internationally renowned scientist, declared that "it is philosophy and religion which have betrayed us, not the engineers."

Science, he declared, must turn its attention to two things, both of them of high social importance: "the public explanation of the bearing of our past and current discoveries on the problems of life and society, and the encouragement of the use of at least semi-scientific methods in the treatment of confused human problems in the hope of eventual emancipation from the slavery of slogans."

Dr. Shapley spoke on science in a symposium on "Our Expanding Horizons" before the annual meeting of the Associated Harvard Clubs in New York City. Other speakers discussed education, foreign affairs and industry.

After pointing briefly to recent research in various fields of science, Dr. Shapley said it would be possible to guess what lies ahead, "the future conquests of intellectual man's scientific curiosity — if indeed ahead there lies scientific curiosity or intellectual man, or anything but a trough in the rhythmic curve of civilization — anything but an epoch of realism, marked by greed and inanity.

"But I do not venture to forecast detail," he continued, "partly because you are now thinking of submarines and bombers, blood and explosives —and perhaps you are unkindly saying, 'See what you scientists have done to civilization'."

This charge — "that science has outrun itself, that it has brought woe, and pain and confusion, more than happiness, comfort and order" — are made almost exclusively, he said, "by vain people whose failure to understand the simplest technics have produced an inferiority and a defense.

"If you do believe that the present tragic world order should be charged to physicists, chemists and engineers, then I assume that you have not thought it through," he declared. "There is undoubtedly superficial justification for a hasty opinion of that sort; but is it not true that the tragic decay of the present comes not from the abuse of the sciences and their products, but more probably from the abuse of the ordinary rules of rational intercourse between rational human beings; the abuse of ethics and logic?

"The perversion is of international morality and not of gadgetry. It is philosophy and religion that have betrayed us — not the engineers."

To the contention that the radio helps the charlatan to reach his dupes, Dr. Shapley answered that the same radio "should help still more in releasing people from their natural dupehood."

Science, he emphasized, has "an important social job on the horizon, namely, the intrustion of rationality and logical methodology into non-scientifice fields. I do not know how to intrude successfully — perhaps by education, perhaps by example.

"A great contribution would result if we could depopularize slogans — those common opiates of thought. Mankind suffers from the patter of slogans, the catchphrase philosophies and other cheap substitutes for reasoning.

"Morality in physics and chemistry, I am intimating, is to some extent forced. The scientist is naturally as human in his irrationality as others. But survival requires a kind of honesty. The amoral experimenter poisons himself or blows himself up.

"If only a false economic doctrine, while still prenatal, would also electrocute its progenitor! Or an educational schism backfire during fabrication and reduce its advocate to impotent illiteracy and confusion!" — *Science News Letter.*

Dr. Janette Baldwin 1872-1940

It is with deep regret we chronicle the passing of Dr. Janette Baldwin, of Brooklyn, New York, on December 17 last. Dr. Baldwin has been an esteemed member of the Congress for many years, and has taken a deep interest in the advancement of scientific physical medicine. Our deceased fellow member was born in 1872 and received her doctorate degree from Cornell University Medical College in 1901. She served as a commissioned officer of the Federal Government and was a Fellow of the American Medical Association. The ARCHIVES and the Congress extend her family heartfelt condolence.

THE STUDENT'S LIBRARY

A SURGEON EXPLAINS TO THE LAYMAN. By M. Benmosché, M.D. Cloth. Pp. 317. Price, $3.00. New York: Simon and Schuster, 1940.

One is at a loss to determine why this popular book dealing principally with the technics of operative surgery has been written. To be sure the author devotes considerable space to arguments pro and contra and endeavors to make out a case for his effort, but there is hardly an experienced surgeon who will agree that it can serve a very good purpose to teach laymen the difficulties of operative medicine when it takes years of hard study for adequately prepared medical students to grasp the very essence of this branch of medical science let alone to acquire the knowledge and skill to perform major surgical operations. So far as training the laity to render first aid in accidents and injuries is concerned, there is no dearth of popular books to say nothing of classes organized for Red Cross workers, miners, boy scouts, police and firemen. But to go to the trouble of explaining the instruments, the fundamentals of operative technics and then to describe in detail appendectomy, cholecystectomy, herniotomy, operations involving the genito-urinary apparatus and conclude with a chapter dealing with operations of the brain, lungs and heart can only serve to make half-surgeons out of lay patients and merely add confusion to preconceived notions of the rites practiced in the temples of aseptic surgery obtained from a number of moving pictures.

There can be no question that laymen should take an interest in modern surgery, though in individual cases many patients will perhaps be better off if they rely on the integrity and skill of their surgeons, but such an interest should be furthered in a manner adopted by writers on philosophic problems intended to develop sound thinking among the masses. An historic approach showing the development of surgery from the instinctive help afforded the injured in prehistoric times down to date, perhaps with a glossary or foot notes to explain some particularly technical problem, would in the reviewer's opinion serve much better to attain an understanding of the achievements and limitations of modern surgery and thereby secure also more intelligent cooperation on the part of sufferers who must undergo the ordeal of surgical intervention.

In favor of the book is the colloquial style of presentation. Against it are crude line drawings to illustrate anatomic conditions and operative steps, in fact they are often horribly simple and therefore simply horrible. Again the author has seen fit to cite a number of authorities but has failed to give credit to many men who have originated valuable operations. While this may be excused on the ground that gratification of curiosity does not require scholarship, the author "missed the bus" in not affording the educated (or curious) public a good insight into the latest epochal contributions especially by American surgeons. Surgeons will find little of interest in the book, which can however be recommended to educated laymen with the proviso once given by an eminent physician to a woman who treated her children by a popular book entitled "the family physician": "Look out," the physician warned, "for you may kill through a typographical error."

MANAGEMENT OF THE CARDIAC PATIENT. By *William G. Leaman, Jr.*, M.D., F.A.C.P., Assistant Professor of Medicine in Charge of the Department of Cardiology, Woman's Medical College of Pennsylvania, Philadelphia, etc., etc. Cloth. Pp. 705 with 255 illustrations. Price, $6.50. Philadelphia and London: J. B. Lippincott Company, 1940.

No other disease has been as publicized with all the dramatics of morbid coloring as that devoted to affections of the heart. Accordingly both student and practitioner have acquired a degree of mental fixation which when translated into utilitarian effort find both reacting to the needs of the cardiac patient with a handicap often born of clinical and classroom impressions regarding the limitation of our therapeutic intervention and the all importance of diagnosis. That this impression is based on half truths and that advances in this field have provided new methods and clinical facilities of greatest value is the implication of this thesis. Indeed, one gains the early impression that progress in cardiology has been as keen as in other specialties, and this requires not only a restatement of the known facts but also a further interpretation based on their latest analysis. The problem as seen through the eyes of Leaman is evaluated with the object of providing the country doctor or general practitioner with fresh and clear guidance in his great responsibility for the care of the majority of cardiac patients. For this reason the author has eschewed discussion of a purely academic nature and emphasized by means of apt illustrations and lucid exposition the various therapeutic and diagnostic procedures essential to the management of the cardiac patient. In the space of 24 chapters he has assembled and organized the most important data relative to the practical approach of the problem. The work describes and evaluates the physical and laboratory methods used in the examination of the patient. Emphasis is placed on the present-day recognition of the importance of classifying and treating heart disease according to its etiology and the functional capacity of the patient rather than in the light of structural defect. The work is the result of ten years' effort and seventeen years of study. It is replete with case reports and certain clinical intimacies indicating the clinician at the bedside and the attitude of the seasoned teacher in his objectivity toward his problem. In many respects part of the

discussions have been left to the responsibility of others for which due acknowledgment is given them by the author. Thus Dr. James Lehman is credited with the description of operative procedures in hypertension, suppurative pericarditis, aneurysm and effort syndrome, while Dr. Charles Steiner discusses the injection treatment of angina, and Dr. Henry D. Jump presents his views on the wiring of aneurysms. Physical therapy is also acknowledged as an important aid and the chapter devoted to its discussion reviews both the values and limitations of electrical, radiant and manual efforts as well as the problem of therapeutic exercise in cardiac disease. The last chapter may be said in itself to represent a lucid monograph of the value of electrocardiography in the diagnosis of heart disease. This is a very practical book and is highly recommended.

THE 1940 YEAR BOOK OF GENERAL MEDICINE. Edited by *George F. Dick*, M.D.; *J. Burns Amberson, Jr.*, M.D.; *George R. Minot*, M.D., S.D., F.R.C.P. (Edin. and Lond.); *William B. Castle*, M.D., A.M., M.D. (Hon.) Utrecht; *William D. Stroud*, M.D.; and *George B. Eusterman*, M.D. Cloth. Pp. 934 with 212 illustrations. Price, $3.00. Chicago: The Year Book Publishers, Inc., 1940.

The brothers Head — Gustavus and Cloyd — who initiated the year book series forty years ago rendered by this venture such an inestimable service to medicine that one is certain that posterity will recall their contribution with warm gratitude and affection. The success of this publication is based today on its recognition as perhaps the most practical effort to present "hot-off-the-fire" contemporary trends and opinions in the practice of medicine and the allied sciences. Progressive physicians have come so to depend on these annual books of abstracted opinions selected and culled from the world's most advanced thoughts that today their distribution is not a question of salesmanship but rather a problem of supply to an ever increasing demand. The volume under consideration — general medicine — is not only one of the best or popular in the series but is so full of meaty facts and replete with comments by the distinguished editorial staff that it virtually represents a classic in its field. As an index that one's enthusiasm is justified by fact is the reviewer's recent experience in the library of perhaps the foremost medical school in the Middle West, where he saw this series of year books industriously thumbed by senior students as a form of collateral reading outside of assigned text books. This indicates that both instructor and student have come to appreciate that modern medical education can be fortified by this source of valued information, selected by an editorial faculty whose authority reaches beyond the average of any one individual's intramural experience.

The 1940 Year Book of General Medicine contains many features of special interest. Besides carrying over 900 pages of reading matter, in which are incorporated 567 abstracts selected from 6,600 articles, it includes an historic review in the form of a preface which recapitulates the growth and literary background created by famous physicians who initiated and carried the series to its present famous state. It presents five special and previously unpublished features; namely, "Oral Immunization Against Scarlet Fever" by George F. and Gladys Henry Dicks; "The Physician in the Tuberculosis Campaign" by J. Burns Amberson, Jr.; a color-plate on differential diagnosis of congenital hemolytic jaundice with text by George R. Minot and William B. Castle; "Digitalis, its Indication and Best Method of Administration" by William B. Stroud; "Carcinoma of the Stomach: A Challenge to the Profession" by George B. Eusterman. The volume is richly illustrated and is so replete with timely and practical facts that it ranks among the most interesting and profitable investment afforded the profession. A physician without the year book series is like a sailor without his compass — a "must" guide in the complicated factors that make up the practice of medicine.

SPEED AND FUN WITH FIGURES. By *T. O'Conor Sloane*, Ph.D., LL.D.; *J. E. Thompson*, B.S., in EE., and *H. E. Licks*. Cloth. Pp., Vol. I, 184; Vol. II, 220; Vol. III, 155. Price, $3.50. New York: D. Van Nostrand Company, Inc., 1940.

The number of interesting books published to titillate the interest or fancy of those more or less inclined toward intellectual relaxation is legion. In this group the work about to be discussed merits especial attention because it should particularly appeal to the rank and file of the medical profession and certainly to those who have a leaning toward the physical and mathematical division of science; namely, the physical therapeutist. Here is a volume that incorporates three separate books that will stimulate the mind more pleasurably and certainly more profitably than is expended on current forms of word puzzles and the like. It is both recreational and practical, for it is entertainment in the grand style. It teaches through the medium of the printed page the attainment of a mastery of quick calculations in arithmetic and mathematics without the tedious labors associated with such study. It is profitable education because it teaches in simple methods the art of rapid arithmetic, the manual use of the slide rule and the recreational value of mathematics. If it difficult to realize that as presented here by foremost authorities, clean and intellectual amusement can be found in a better knowledge of addition, subtraction and multiplication, and a keener zest for life can even be attained by the employment of the spare moment in the fascinating study of the interplay of problems and conundrums based on mathematics and the like. When material pleasures fail, here is a form of relaxation that can be converted into a clean and practical pastime, akin to the diversion of the intellectual aristocrats who prefer their amusement to be a fascinating form of keen edged intellectual competition. In entertainment the book may be likened to intellectual champagne, and for those whose taste runs in this direction, the book is highly recommended.

INTERNATIONAL ABSTRACTS

Report of Research and Experimentation in Exercise and Recreational Therapy. D. D. Campbell, and John Eisele Davis.

Am. J. Psychiat. **96**:915 (Jan.) 1940.

This report involves the operations of the highly diversified program of physical education carried on over a period of 17 years at the Veterans' Administration Facility, Perry Point, Maryland. The rationale of play as a general balancing and reparative agency has been studied. The authors have no intention to discuss its purely psychologic setting, but rather to indicate what appears to be certain distinctive applications of physical educational methods and form to the increasing armamentarium of therapy.

A wide category of both formal and informal activities has been attempted for the acute service, including calisthenics, swimming, gymnastics, soft ball, volley ball, impromptu games, such as medicine ball circle passing. Of 40 patients on the ward, ranging in age from 35 to 40, 38 participate in some form of physical therapy, 20 take part in forms of social play while 18 confine their activities to more mechanical and individual types of exercise, such as swimming and calisthenics, 18 play in the soft ball league. A very definite line of social demarcation is observed between the groups who are able to find elements of extraversion in their play experiences and those who retain their predominating anti-social traits. Eleven patients appear to show some improvement in their social readjustment as evidenced by some of the following: (a) Greater modificability to social practices; (b) increased range of interest; (c) greater control of emotional field; (d) more cooperativeness; (e) more insight; (f) brighter attitude; (g) increased range of physical activity; (h) stronger volition. The primary motif for these acute cases was to provide sedative and relaxing modifications through exercise.

In observing these patients as they take part in a league soft ball game, for example, one is impressed with the high degree of concentration and the surprisingly intense effort attained. Many apathetic patients will make an unusual effort while playing these games. Very regressed patients are frequently seen backing up plays, demonstrating an acute though spasmodic orientation in the game. Others are observed to show evidence of appreciation for the good plays of their comrades as well as to criticize faulty plays. The sublimination of anti-social behavior is most evident. In a recent game, a player of the acute ward collided violently with another player, a combative type. It was expected that he would become emotionally upset and assaultive. To the surprise of all, he arose, walked over to the other player, said he was sorry and asked if he was hurt.

An intensive program of physical therapy was attempted for the suicidal type of patients. There were 35 in this group, ranging in age from 35 to 40 years. Sixteen took part in formal types of exercise, such as swimming, calisthenics and gymnastics and seventeen in informal types of exercise, includng soft ball, baseball, tennis, bowling, volley ball, code ball. Two did not take part in physical therapy, because of confused, stuporous condition resulting in a disorientation toward these activities. During the past six months, eight have been transferred to other wards as a result of their improvement. The objective for these suicidal cases was to re-establish spirit and morale and physical therapy seemed admirably suited for the purpose when considered as a long-range activity. At the beginning many were antagonistic toward efforts to enlist them into any form of exercise. They were resentful because of their restriction and did not participate. As leagues became organized and many types of activity included in the general program, some of these patients would request to take part and at present all but two of these types will take part in calisthenic exercise, many of them showing real interest and spirit, a number have been transferred to another ward and now are making a satisfactory adjustment to the more responsible procedures of work.

The authors do not wish to create the impression that physical therapy has been viewed as a panacea. Its many limitations, both as to content and methods have been apparent in attempts to utilize many and diversified activities nor has physical therapy been employed as a purely independent adjuvant. The ideal therapeutic program advocated and carried out has represented a balanced regimen of work, rest and recreation. Attempts are constantly being made to impress patients with the importance of progressing from play activity to the more responsible role typified by work so that they may be assisted in their return to normal responsibility.

Effect of Early Subcurative Arsenical and Thermal Treatment on Development of Specific Immunity in Syphilitic Rabbits. Ira Leo Schamberg.

Am. J. Syph., Gonor. & Ven. Dis. **24**:401 (July) 1940.

In an attempt to throw further light on the mechanism of the change brought about by early antisyphilitic treatment, a study was made of the course of the infection and the results of late reinoculation in untreated, inadequately and adequately treated syphilitic rabbits. In the first experiment the author observed rabbits treated early with curative and subcurative doses of one of the organic arsenicals. In the second experiment the effects of subcurative early treatment by fever (before the forty-fifth day) were studied.

Schamberg and Rule, Breinl, Carpenter and his co-workers, Richet and Dublineau, Levaditi, and Simpson have shown that heat treatment not only

heals the lesions of syphilis in the rabbit and causes disappearance of treponemes, but in some instances also brings about a cure as judged by lymph transfer. Thus administration of heat by any means which raises the body temperature to a sufficiently high level has been shown to be an effective form of therapy in experimental syphilis, though it is less potent than arsphenamine. A parallel study of the effect of subcurative treatment by each of these two methods was, therefore, considered to be of interest.

Effect of Interaction of Ions, Drugs and Electrical Stimulation as Indicated by the Contraction of Mammalian Unstriated Muscle. Inderjit Singh.

J. Physiol. **98**:155 (May) 1940.

Adaptation in frog as well as mammalian muscle increases with temperature. Compared to plain frog muscle, adaptation in plain mammalian muscle is slow. This enables the latter to function at higher temperatures at which the excitability of frog muscle is low.

The majority of the substances, anions, cations and drugs, affect the excitability including potassium in the direction of anodal closure, but the two excitabilities can be distinguished by the differential effect of hydrogen and calcium ions. Mammalian plain muscle is highly sensitive both to electrical and chemical stimulation owing to slow adaptation. Mammalian plain muscle does not exhibit the anodal closure off-contracture. Marked changes in excitability are produced by very small concentrations of drugs. Contraction is caused by withdrawal of nitrate, thiocyanate and ammonium ions.

Muscle Strength Testing. C. L. Lowman.

Physiotherapy Rev. **20**:69 (March-April) 1940.

In the acute stage of poliomyelitis the physician and the neurologist will wish to have the patient's muscles checked daily to estimate the spread of paralysis or its increase in already involved muscles. Residents and internes sometimes make these early checks; later, the physical therapy technicians and orthopedic attendants will take up the case.

A definite clinical method is recommended for testing muscle strengths in any and all stages in order to determine improvement or retrogression of neuromuscular function. Lowman has found that if one technician does all the testing, the degree of accuracy becomes increasingly exact and dependable. In institutions having several technicians, all should receive such training, but whenever possible one person should record the findings for the surgeon as a guide to operative reconstructive procedures. The chief muscle tester should be the technician who is best posted on kinesiology and who understands how best to elicit responses and to estimate the relation between intrinsic and extrinsic action and the various substitutionary movements which enter into a given performance.

The author describes his methods of strength testing and concludes that recording muscle group strengths are time-saving in a busy clinic, as the surgeon can quickly determine the imbalances and visualize joint function and control, which is what he is most concerned with in outlining his plan for reconstructive surgery.

Actinic Studies and Results of Vaginal Irradiation in Diseases of Women and Hemorrhagic Conditions. A. F. Landeker.

Med. Rec. **151**:135 (Feb. 21) 1940.

The Landeker lamp which is attachable to any light circuit of six amperes, throws the rays accumulated in the dome into a funnel-shaped extension. This irradiation tube with the aid of corresponding specula enables the necessary and exact localization and fixation of the cervix and of the vaginal quadrants. Its spectrum is a relatively constant and intensive one including in the ultraviolet portion the more penetrating rays between 4,000 and 2,800 Angstrom units as well as visible rays from the red yellow portion of the spectrum. These rays have great penetrating power and a series of animal experiments has confirmed that these rays do penetrate from the vagina into the pelvis. At the same time, the spectrum of this lamp has a sufficiency of the shorter ultraviolet rays between 2000 and 3000 Angstrom units and therefore, there is an outspoken bactericidal effect, but these shorter rays have not the intensity of those present in the mercury vapor lamps so that long vaginal irradiation of twenty to thirty minutes can be given without risk of burning.

Regardless of the actual nature of this type of actinotherapy in which sufficient research work has not yet been done, it cannot be denied that, in accordance with investigations of the electromagnetic and corpuscular character of photoactivity, the type of the striking ray projectiles fundamentally influence the electric condition of the irradiated tissues.

The author's lamp is indicated in leukorrhea, colpitis, cervicitis, inflammatory affections of the uterus, of the pelvic connective tissue and the pelvic peritoneum and adnexa, primary endocrine disturbances and correlating secondary disturbances of the ovaries in dysfunctional conditions and the like.

Tuberculosis of Bones and Joints in Children. Georg Wolfsohn.

Med. Rec. **151**:206 (March 20) 1940.

The open air treatment and exposure to sunlight which became well known and enjoys great favor, is a great advance in the treatment of surgical tuberculosis. Patients suffer no pain and prefer a treatment in which natural powers play the main part. Rollier describes a definite procedure by which to accustom the patients to air and sunlight and the simple agents which he employs as adjuvants. A great disadvantage is the duration of this therapy, as it must be continued for many years. Rollier tried to have his patients continue work in their individual occupations which, from a psychic point of view, also proved to be of great advantage.

The results of this therapy are really astound-

ing. It is assumed that the number of relapses is larger than stated by the various authors in their statistics. The author saw many of such relapses while new foci may develop during treatment.

Even without special institutions, ambulant cases of surgical tuberculosis in children show favorable results, provided that directions are strictly followed and the course of the illness can be supervised at all times. This is impossible if conditions at home are unfavorable.

It is an interesting fact that change of climate and location has a favorable, stimulating effect. Surgical tuberculosis can also be acquired in mountainous regions. If such patients are brought to the seashore or a protected lowland they will show almost equivalent beneficial effects as are manifest in patients who have been sent to alpine climates. Such changes from the usual surroundings and location have exerted a beneficial influence also on patients undergoing an open air and sunlight cure. Unfortunate and sometimes detrimental to the patient's condition is the change in medical care necessitated thereby.

Oral and Medical Treatment of Gonorrhea in the Male. P. S. Pelouze.

J. A. M. A. **114**:1878 (May 11) 1940.

Pelouze points out that prolonged hyperthermia cannot be dismissed in a summary fashion. Sustained elevations of the body temperature above 108 F. will cure gonorrhea in many cases. That lower temperatures are less efficient and require more sessions of treatment also is established. It is equally certain that the method has dangers that are not to be viewed lightly and a mortality far greater than the disease itself. The method requires equipment, trained personnel and time, which puts it out of the reach of the masses except, perhaps, when it is done experimentally. It is the opinion of outstanding investigators that, in the male, it should be used for only those who resist cure by other methods and in the treatment of the graver complications of the disease. Such a view limits the urgent need for prolonged hyperthermia to a point where a physician has no cause to feel that he is guilty of denying his patient the best because he does not urge it. Almost all cases of gonorrhea in the male can be cured by other means and few of the complications, other than arthritis, are of such gravity or so resistant to treatment that they do not subside within a short time under less dangerous and less uncomfortable modes of attack.

The Problem of Rheumatism and Arthritis. Review of American and English Literature for 1938. Philip S. Hench; Walter Bauer; M. Henry Dawson; W. Paul Holbrook; J. Albert Key, and Currier McEwen.

Ann. Int. Med. **13**:1655 (March) 1940.

The true value of fever therapy in gonococcic arthritis has been difficult to assess because some patients tend to recover spontaneously and rather rapidly, and most workers have not compared their results from fever with those from less strenuous methods. Hence the second report of Schnabel and Fetter with controls is of special interest. Cures were obtained in 68 per cent of 70 acute cases treated with fever therapy but in only 6 per cent of 70 acute cases treated otherwise (old methods: local chemotherapy and physical therapy). The average period of hospitalization for treatment was 21 days in the first group, 39 days in the second. Cures were also obtained in 26 per cent of 23 chronic cases treated by fever but in only 4 per cent of 23 chronic cases treated otherwise. The average period of hospitalization was 33 days for patients given fever, 143 days in those treated otherwise. These statistics certainly indicate the superiority of fever therapy over older methods.

These reports present further evidence that complete cures are obtained in 70 to 90 per cent of acute cases and in about 60 to 80 per cent of chronic cases of gonococcic arthritis in which from two to four (occasionally six to eight) fever sessions are used. The fever sessions almost uniformly consisted of five or six, occasionally seven, hours of 106 to 107 F. (rectal) given every two to four days.

Keratosis Blennorrhagica. A Brief Review and Report on the Effects of Hyperpyrexia in its Treatment. Frank C. Combes; Carlisle Dietrich, and Julius Cohen.

J. A. M. A. **114**:2078 (May 25) 1940.

Local treatment is of little value. Ointments of resorcinol, salicylic acid and sulfur may be of benefit in their effect on the individual lesions.

The most effective therapeutic procedure is artificial fever. It should constitute the nucleus around which all treatment is planned. Favorable response to this method has been reported by a number of authors. Intravenous injections of typhoid-paratyphoid vaccine have not been attended by very consistent results. Epstein and Chambers report rapid improvement following the induction of a temperature in excess of 104 F. by the blanket method. All visible signs of the disease disappeared within a week and the arthritis greatly improved. Early cessation of fever therapy may be followed by a relapse if the primary focus of infection has not been eradicated. This method is valuable when patients cannot successfully withstand surgical intervention. In addition to improvement in the visible lesions and joints there is a rapid favorable response, both mental and physical, such as cannot be obtained by other means.

The authors conclude that keratosis blennorrhagica is a distinct entity characterized by polyarthritis and cutaneous keratoses in the presence of a gonorrheal infection.

Multiple Sclerosis. C. W. Steele, and E. C. Higgins.

Maine Med. J. **31**:35 (Feb.) 1940.

The cause of multiple sclerosis is unknown and therefore the present treatment is empiric and extremely difficult of evaluation because of the characteristic spontaneous exacerbations and re-

missions in the natural course of the disease. Therefore it is not surprising that when a remission occurred the form of treatment given at that time received the credit. Nonspecific measures should consist of improving and maintaining the patient's general health and nutrition. He should rest during an exacerbation and until improvement begins, and encouraged to live during remissions as nearly a normal life as his condition will permit. Foci of infection are best removed. Overfatigue is to be avoided. Inorganic and organic arsenic have long been a part of the older type of routine treatment for multiple sclerosis. Hyperpyrexia has been recommended, but most physicians who have had experience with it are not in favor of either foreign protein or fever therapy. They feel that it may more often than not make the patient worse. Until a larger series of cases has been studied, this form of treatment should be used with care. The authors suggest that all early cases of multiple sclerosis be treated by a regimen of fresh air, sunshine, a diet rich in vitamins and protein, additional large doses of vitamin B and intramuscular injections of liver extract. Until such time as more is known about the cause of the disease, it would seem wiser to use the less concentrated liver extracts and products which contain both vitamin B_1 and B_2. — [Abst. J. A. M. A. **114**:1964 (May 11) 1940.]

Facilities for Fever Therapy. Franklin G. Ebaugh, and Jack R. Ewalt.

Mod. Hosp. **56**:53 (July) 1940.

Fever therapy is the recognized treatment for dementia paralytica and for cases of tabes dorsalis that do not respond to chemotherapy alone. In the clinic of Colorado Psychopathic Hospital it is also the treatment of choice in primary syphilitic atrophy of the optic nerve. In all instances, chemotherapy in the form of tryparsamide or neoarsphenamine and bismuth salicylate is administered during each fever session. Each patient receives 12 treatments of three hours each at a temperature of 105.8 F. Most patients take two treatments weekly. Following the course of heat therapy, all patients receive the standard course of chemotherapy, which consists of continuous treatment with alternating courses of tryparasamide, neoarsphenamine and bismuth salicylate.

Complications of gonorrhea usually respond satisfactorily to properly applied fever therapy. No case should be treated with pyretotherapy until it has had a thorough trial of sulfanilamide or some of the compounds of this group. A certain number of cases of gonococcal arthritis, prostatitis, salpingitis and conjunctivitis fail to respond to chemotherapy, however, and in these cases fever therapy offers valuable therapeutic aid.

Sydenham's chorea responds quickly to physically induced fever. Patients should be given two and one-half hours of fever at a temperature of 105 to 105.4 F. daily or with only one intervening day. In our clinic the method has been most efficient in curtailing the course of the condition. Cardiac complications of the rheumatic type do not contraindicate treatment.

Nonspecific iritis and uveitis respond promptly to fever therapy. Patients in these categories receive one or two five hour sessions each week at a temperature of 105 F. The ordinary case requires only two or three treatments.

Fever offers a valuable therapeutic aid in such conditions as chronic infectious arthritis, intractable asthma, undulant fever, chronic osteomyelitis, Wassermann fast somatic syphilis and chronic indolent lesions of the skin. In none of these diseases is fever to be considered as the treatment per se, because the pyretotherapy serves only as a means of stimulating and heating tissues in conditions in which such an effect is desirable. In all such cases the ordinary accepted procedures for the condition should be used concurrently with the heat therapy.

Body Build and Hypertension. S. C. Robinson, and Marshall Brucer.

Arch. Int. Med. **66**:393 (Aug.) 1940.

A review of the literature shows that no rigidly controlled statistical study on a sufficiently large series has conclusively established a positive correlation between blood pressure and body build. Some writers contend that no correlation whatsoever exists. In this study of blood pressure and body build, made on 3,658 persons, an index derived from dividing the chest circumference by the standing height was used as a ratio of width to height to distinguish the narrow linear type of persons from the broad lateral type. The relation between lateral build and hypertension and between linear build and low blood pressure is found in all age groups. The incidence of high pressure increases and low pressure decreases with age in men of lateral build. In those of linear build the incidence of high pressure is constant up to the seventh decade; the incidence of low pressure is constant throughout life. The incidence of high pressure increases with age more markedly among women of lateral build than among those of linear build, and at every age the incidence of low pressure is greatest among the women of linear build.

Artificial Fever Therapy in Multiple Sclerosis. A. Bennett, and Murray D. Lewis.

J. Nerv. & Ment. Dis. **92**:202 (Aug.) 1940.

Except in the early group of cases and those having signs which suggest infection, there is little evidence that fever therapy has any markedly beneficial results in multiple sclerosis. This is probably true, no matter what the mode of fever production. Particularly do the results not bear out the reports of Neymann and his collaborators of marked and sustained improvement from fever therapy.

The results indicate that it should be tried in early cases, of short duration and ambulatory without assistance. In the intermediate types requiring assistance to be ambulatory but not completely disabled, the benefits derived from fever therapy are doubtful. Other less vigorous methods of therapy are indicated. In the bedridden group, in which the completely disabling symptoms are of long duration, fever therapy does no good and may do harm.